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American Amalgamating Machinery—The Silver Mill.

Our illustration this week shows the arrangement of a silver mill for dry crushing, and provided with a Stetefeldt furnace for chloridizing the ores. The reduction of the ore to the proper size begins in nearly all cases with the Blake crusher. From that it passes to the stamping floor, in this case to a self-feeder, which supplies it to the stamps. When the ore is roasted a drying floor is placed between the rock breaker and the self-feeder. This floor is made of cast iron plates 3x3½ feet square and flanged on two contiguous sides. The plates overlap, and rest on walls forming a double flue under them. Heat is supplied by what would otherwise be the waste gas from the chloridizing furnace. The dried ore is shovelled to the stamps or to the self-feeder. From the stamps the powdered ore is conveyed by a traveller to a bucket lift which raises it to a pulp feeder on the top

of the furnace. In the latter it immediately reaches a red heat, the extreme fineness of the particles making the process of heating almost an instantaneous one. It falls through an atmosphere of hot chlorine gas and by the time it has reached the sole of the furnace, 85 to 96 per cent. of the silver has been thoroughly chloridized.

From the furnace the pulp is drawn on the cooling floor, from which it goes to the pans, the principal styles of which we have already described. From the pans to the settlers and thence to the agitators, the pulp passes until it has not only been thoroughly treated but has deposited the last obtainable portions of mercury. Its last work is to collect in the settling vats outside the mill from which it is taken and stored up in the hope that improved processes will one day make its remaining wealth available.

When no chloridizing furnace is employed, the pulp is sometimes received from the stamps in cars and taken direct to the pans. Other details are often altered to suit the circumstances of particular cases, but our illustration fairly represents the general arrangement of the mills built by Messrs. H. J. BOOTH & Co. of San Francisco, who are by far the largest builders of mills and milling machinery on the Pacific coast. One of the main points in these mills is the disposition of the belting. It has received the closest attention of mill builders who have brought the system to a wonderful state of efficiency.

On the Wasting of Coal at the Mines.

By J. W. HARDEN, M. E.*

At our meeting in October last we saw in operation at Pittsburgh, the comparatively modern process of the utilization of small coal by washing, after an arrangement similar to that of BÉRARD or MORRISON. The small coal washed was that of an old pile, the refuse of the mining of the Pittsburgh bed, and which had long lain uncared for. Value was thereby restored to it when it was converted into a very good coke.

This circumstance led to comments on the mountains of broken coal lying wasted, and in its present condition worse than useless, in the neighborhood of the mines of the Wyoming Valley, though they are not confined to this district. Some things were said condemning the course which produced it, some were left unsaid. Of a system that destroys one half the coal bed in producing the other half there can, however, be but one opinion. Schemes have been suggested for the utilization of present accumulations which, if successfully applied, would in so far be beneficial. More than ordinary attention is now being given to the same subject in England; a Mr. BARKER has invented a means by which he amalgamates the "dust," too fine to burn in ordinary grates, with a composition he calls "diamond cement," producing blocks of coal said to resist water, both hot and cold, and which a smart blow will only break to pieces, not cause to crumble. But any scheme less than the one which will prevent the wasting of coal, which still goes on, though that involves the abandonment of the breaker, will only be one of expediency; and the latter can only be done by the aid of the consumer.

* Read before the American Institute of Mining Engineers, at its Boston meeting, Feb. 20, 1873.

But the wasting of coal is not alone with the breaker, much is made in the mine. The cause is not far to seek, the remedy is with capitalist and owner. Owners and consumers then are alike interested, and they have it in their power, in the one case, to mitigate, in the other, almost entirely to remove the cause of the evil. Of consumers there is one in every householder of the city, and of capitalists interested in one form or other, there are many, hence my reason for choosing the subject of this paper at this, our Boston meeting.

In discussing this matter, we will take the waste made at the breaker first. Every consumer knows that when ordering coal he can obtain it of any size he likes, out of a list with which he is acquainted, made up of lump, steamer, large egg, small egg, stove, chestnut and pea, each representing a particular size, and he also knows that to have provided them the coal has had to be broken purposely and prepared, but I doubt whether he is aware of the quantity wasted in this preparation, and for which waste, as well as the cost of making it, he has to pay in the price he pays for the coal he uses. This he will see the equity of, but, unacquainted with the process of preparation, wonders why it costs so much. For his information we will describe it.

The coal turned out of the mine, whether by shaft, slope, or tunnel, is hoisted some 60 to 100 feet above the surface, to the top of a building known as the "breaker," where it is dumped, the small passing through a screen of longitudinal bars, the large into a hopper guiding it through and between a pair of cast iron rollers armed with strong conical and bird-bill like teeth. These revolve and break up the coal to larger and smaller pieces, which fall, as it is broken, into cylindrical screens. These have a circumference of under or over 15 feet, formed of various sized meshes, fitted on a revolving shaft. The various sizes are separated and collected into the varieties named, during which process and while passing to the shoots into pockets provided for it, boys are employed to pick out the slate once adhering to the coal and broken up with it.

Now the consumer will have noticed that this coal, of whatever size, is rounded at the edges, the angles made in breaking are worn off; this is owing to the distance the pieces have had to travel in being whirled round and round and on and on in the screens, at a speed of 200 feet a minute and more, until they come to that screen the mesh of which is large enough to let them through. The edges are ground off by the abrasion and blows against the overlappings of the wire screens and the ribbed intersections of the cast iron ones. The smaller particles of coal not being heavy enough to resist the current of air created, fall through the screen, being floated into the atmosphere in the shape of a thick dust.

Now, as a breaker, there is no fault to find with this machine, it is an ingenious and labor-saving arrangement, and represents fully the name it bears. It is a breaker to all intents and purposes.

But the cost of all this. To the wealthy of the present day, while the coal is within easy reach, it does not signify much, but to the laborer, the poor man with a large family to care for, and in a winter like this, too, it is of vital importance. There is first the cost of the building and machinery, and the steam engine to drive it, which, for a first class breaker will not be less than $100,000, and upon which, of course, there is interest and the redemption of capital to provide. Say a breaker lasts 20 years, as it will with dry coal, and if kept in proper repair; but if the coal is washed or comes out of the mine wet, it will last only about half that time; this will require a sum per year which, divided by the number of tons prepared, together with the cost of engine power and manual labor, will be nothing less than 50 cents per ton, with an addition varying as the above conditions. To the lesser there is the loss of royalty on the coal wasted in the process, the quantity depending on the quality, the hardness or softness of the coal, and the condition of the machinery; soft coal will necessarily make more small than hard, and rollers with worn and blunted points will crush, and, in a manner, grind the coal. More small will be made, too, when passing it through two pairs of rollers, as is often done, breaking it from larger to smaller sizes.

Under ordinary circumstances, with a car holding 75 cubic feet, the miner will be paid for a ton and a half of prepared coal, or four fifths of that sent out of the mine. In tolerably hard coal, and with some watching, it probably will hold out to that, but this difference does not represent the total waste. We have from time to time seen large quantities of pea coal dumped in the "dirt" bank at times when such was not in demand. Disregard to a hole in the screens also sends good coal to the same heap. It is needless for me to say that such cannot take place in well managed collieries, but that it does take place is nevertheless true. The average waste at the breaker, then, will be more than a fifth of that sent out of the mine, and will represent the value of so much merchantable coal.

The foregoing does not, however, represent the cost; men and boys are frequently maimed, and sometimes killed, in the breaker, to say nothing of the injury to health by the constant inhalation of coal dust, a by no means unimportant evil, which some boys probably outgrow on being put to other and more healthy occupation, but which others do not.

To the consumer who asks whether these evils cannot be mitigated, we have said, they can be almost, if not entirely, done away with, but that he must do it, or at least help to do it himself. Operators would be glad to be spared the extra capital and labor which the production of these "fancy brands" of the coal market entails, but having aided in the spreading and cultivation of this fastidiousness, he now has to meet it. It is a mistake to have the coal broken at any other place than that at which it is consumed, or at most not further off than the mart from whence the consumer receives it, and where, in the multiplicity of the wants of a great city, some use would be for all of it, of whatever size. Nothing, however, would so conduce to economy as breaking the coal on the premises of the consumer.

But the consumer says again he is driven to ask for such coal as he has the means of burning, that the best effect from his stove can only be obtained by the use of a given size of coal. I judge this is true, but then stoves in rooms, and iron furnaces in cellars are not the best economizers of heat, the material is wrong; they are moreover great destroyers of health, licking up every particle of the moisture in the air we breathe, changing the normal condition of the lungs and skin, and laying the foundation of lingering disease which, in weakly constitutions, results in death, the cause being ascribed to a something which is only the effect, and no more is thought about it.

To economize heat, then, and efficiently and agreeably to warm a room, that material is best for the fire-place, be it of what construction it may, that absorbs the largest amount as the temperature increases, and gives it out again by radiation. The principle is recognized in the linings of fire brick some inventors have given their stoves, and there is room for a much extended application of it, and at the same time for the invention of a stove that will not need so refined and fastidious a preparation of the fuel. That inventor will render the greatest service, who produces one in which the working man can obtain the heat value of the coal when broken by himself in his own cellar. The breakers at the mine will sooner or later be done away with.

Of the coal wasted in the mine, it has been said to be very considerable in proportion to the amount mined, a question, one gentleman says, "not very creditable to the mining engineering profession," but in which he is not quite just—the mining engineer being seldom consulted about the working of a mine. The inside boss is generally assumed to know the most about it, sometimes the operator has been a miner himself and is therefore said to be a "practical man."

The waste here alluded to is not intended to apply to pillars left in the judicious working of a mine; they are necessary for supporting the superincumbent strata, the mining could not be done without them. It has been suggested that stone pillars might be built to prevent the cavings in which are occasionally taking place, but it is not possible to construct pillars of stone that will answer the purpose of pillars of coal properly left, even if that could be done at a cost of the value of the coal, nor does the anthracite give choice of methods of working: pillars, therefore, must be left where the surface is to be kept up, or where there is coal to be mined beyond them, and where such is not the case, any attempt to mine out all the seam would be accompanied with disaster.

But coal is wasted in a variety of ways in the working, most frequently by the too great haste, after a shaft has been sunk, to get out coal for the market, insufficient pillars being left where the area of coal to be mined beyond would take a time extending over a period longer than the pillars could sustain the weight upon them. In a case where substantial pillars had been left by the operator who first opened and worked the mine, the lease being disposed of to another, wide openings were put through some of them and the remainder "robbed" to an extent which brought down the intervening roof, to the sacrifice of eleven acres of a seam above.

In an instance of a thick seam, where the shaft had been sunk through it, but not low enough, a sump being needed, the seam was commenced to be worked in its top bench, thus taking off the roof of the lower half; the area so stripped will never be gotten.

Another source of considerable waste arises from a disregard to regularity in the position and size of the pillars caused by the uncertain course on which the chambers are driven after being started. Having been worked up 50 or 100 feet, it is not uncommon to find the chambers out of parallel, and the otherwise 15 feet pillar half that thickness, or less. Shots fired in one chamber have blown through to the next, sometimes killing a man, and while the amount of coal left in the aggregate would have been enough, probably, to have kept up the overlying strata, a want of uniformity in the sustaining power of the pillars has permitted a movement finally resulting in a caving in of the surface and a loss of gangroads and the coal in work beyond.

Much waste is often made in the mining of a thick seam. In one of nineteen feet, with a two or three feet parting of slate in the middle, where under tolerably fair management both benches would have been gotten, we have seen sometimes the lower bench mined, sometimes the higher, and occasionally both, as chance or incapacity dictated, producing little more than half the coal the area mined over would demand. Want of system and the lack of ability to deal with the special condition of the seam were the real cause of the trouble.

Of the less fruitful sources of waste in the mine we will only say there are such; enough has been said by others before me, showing that inquiry is neither premature nor out of place, it is a question which does not only concern the owners of coal properties but every member of the community. To the capitalists in the coming competition with bituminous coals of which the whole seam of many feet may be mined out and the very smallest of it turned to account, there is matter for thought.

I have said the owner has in himself the power to remedy much of this. In a business which he can by the light of day overlook, no corner of it is left unscrutinized, no part of it unproductive of profit, but the cause is at once ferretted out. No expenditure of money is begrudged where he can see a prospect of return. But, when the same individual owns, or is interested in, coal property, the successful working of which is out of his ken, and calls for the exercise of man's best faculties, he leases it to another without supervision or check, contented while he receives the stipulated royalty, or until some hitch takes place, when he

discovers that he is not so well versed in his own affairs as he ought to have been. The lease granted stipulated that the mine should not be worked "in any unusual or unskillful manner" and he had relied upon its protecting him; he had the power to enter the mine, but had never availed himself of it, but he now finds that the income from property which he had reason to believe would provide for the lives of his children, will barely last his own, and that more intellect is necessary to the proper mining of coal than he had conceived. This is not a fanciful case.

Not to go into the details of a mine lease, it will be sufficient for our purpose here to notice the clause bearing more particularly on the care to be taken of the mine. Quoting from a lease before me, it is provided that the lessee for himself etc. "will, at his own cost, work the mine in a judicious and workmanlike manner for the term of —— years from —— to ——, that he will leave sufficient pillars of coal for the support of the gangways and the protection of the mine generally, that he will not work the same in any unusual or unskillful manner, that he will mine — tons per year," etc.

Here, then, is all that is said about the mining, and enough if carried out in the spirit of the intent, but the letter ought to have been such that no two constructions could be put upon it. Easily defined by WEBSTER, what is judicious or unskillful or a sufficient number of pillars, to the mind of one individual, as has been exemplified in more than one instance before the courts, is not so to another. A course pursued in the mine and deprecated in evidence by one engineer as certain to result in loss, another has testified to as not being injudicious.

Complaint has been made that lessees have worked out parts of the mine and abandoned them before the lessor has had an opportunity of knowing for himself what had been done; in one instance it was found he had given absolute possession for a term of years, in the fact that the clause which should have empowered his entry had been omitted in the lease, and from causes explained only by facts afterwards ascertained, he was for months debarred entry.

In all of this, then, the owner has the power of remedy; it is not impracticable in any given case, without embarrasing the lessee, to frame a clause which, put into practise, would secure the interest of both, and in so doing strengthen their relationship. The method of mining should be named; it might be that usually followed in the neighborhood; a minimum size of the pillars protecting the shaft or whatever the entrance to the mine might be, should be specified, as well as the area of the chambers to be worked and the size of their pillars; a competent person should be appointed by the owner whose business it would be to see that these provisions are properly carried out, to make periodical surveys of the workings, and report on the condition of the same; in which he should be provided by the lessee with facilities for doing, and have the assistance of the overman and those he would appoint; and no workings should be abandoned before notice had been given of the intention to do so.

It has been said that lessees have not the opportunity of making the best of the mine for themselves or the owner, owing to the short period over which their tenure frequently extends: this should be remedied; every facility consistent with the proper working of the mine should be given, nothing reasonable withheld, as on the lessee rests the greatest share of contingencies and risk.

Great Success of Long Work in Coal Getting.

Elsewhere we have given a brief account of the business at a recent meeting of the South Midland Institute of Mining, Civil, and Mechanical Engineers, whose headquarters are in Wolverhampton. The adoption of the "long wall" in preference to the "square work," has resulted in much economy in the getting of the famous Thick coal of the Mid-England field, even as long wall has here and there superseded with much success the "pillar and stall" method of the northern and western coal fields. But we know of no place in which so splendid a result has followed upon a change of method at all comparable to that which occupied the attention of the Mining Engineers in South Staffordshire last Monday. Mr. GETHING seems to have adopted a plan which the arrangement of the strata in his pits eminently favored; and which in such cases appears to be hardly less than absolutely perfect—for he gets out all the coal. The thickness of the different seams of coal he has to work Mr. GETHING, gives as here:

Waste....	Stinking coal.....	2 ft. 4 in.		
	Bibble batt.....		0 ft.	4 in.
Second, or top coal working.	Top coal and springs.....	4 ft. 4 in.		
	Bibble batt.....		0 ft.	6 in.
	Bibble coal.....	1 ft. 1 in.		
First, or lower work.	Fire clay batt.....		1 ft.	3 in.
	Fire clay coal.....	4 ft. 4 in.		
	Fire clay.....		0 ft.	10 in.
		12 ft. 1 in.	2 ft.	11 in.

Thus, in round figures, he has 12 feet of coal and 3 feet of batt, or refuse to deal with. And this is how he proceeds to get it.

In the usual way, he drives out the gate roads, parallel and about 60 yards apart, to the boundary of the workings, in the bottom part of the coal, and thurls the "navvys" across the back, to form a face of work; but instead of beginning to cut in the top coal and forming pillars to support the roof, he commences holing to the fire clay underneath the bottom of the coal the entire length of the face, about 160 yards, and gets down the coal and batt up to the bibble coal, which he has for a roof. This gives him 4 feet 4 inches of coal and 1 foot 3 inches of batt for his first workings. The batt furnishes him with builders for his first or lower workings, which are carried in advance of the second, or top work, about 5 to 10 yards. And so the first, or lower work, proceeds, losing sight of all the coal above, until the subsidence has taken place. The next work is to cut down the bibble, top coal, and springs in the gate road, behind the first work, so as to form a road up for the top workings. At this point an extra expense is incurred, as it is necessary to thurl the roads again across the back of the top work and on the "gob" of the first work, to form "navvys" for the second workings. There is now a proper ventilation throughout. By hanging sheets on the road between the first and second work the air is driven all round the two workings, and the whole is thoroughly ventilated.

The second workings are began by holing on the top of ob of the first work, and taking down the bibbles, top coal, and springs, setting timber up to the Stinking coal, which forms the roof for the second workings, and gives 5 feet 5 inches of coal and 10 inches of batt. There is now 2 feet 4 inches of coal untouched, called the Stinking coal. This is got out by leaving wastes in the second work, and rifling in the coal over the cogs which have been built from the 10 inches of batt and a portion of the bibble coal, which is rather inferior, and "grews" to the batt. In picking in the Stinking coal up to the binds, which run about 12 yards thick over the coal, there is occasionally got a few tons of ironstone. This breaks down with the binds, and supplies more builders for cogs up to the Stinking coal. In this way the work proceeds throughout, some three acres being obtained every twelve months.

The winning of 29¼ acres worked out in the old style of square work has produced 180,537 tons of coal and 61,238 tons of slack. Hence it is clear that an acre will produce 6,119 tons of coal and 2,075 tons of slack. The proportion is about three-fourths coal and one-fourth slack, or a total per acre of 8,194 tons. These are the figures furnished by Mr. GETHING. It is necessary to explain that the tons mean 24 cwts., and that the hundredweights are 120 lb. each. Estimating the results of the new style of working, a calculation has been based upon 10½ acres. This quantity, won by long work, produces 110,788 tons of coal and 24,912 tons of slack. Thus it is seen that 10,577 tons of coal and 2,408 tons of slack, or 12,965 tons per acre, is secured from the new method, and in the proportion of four-fifths coal and one-fifth slack. In comparing these figures it is seen that the same quantity of slack is got by both systems, but that by long work 4,458 "tons" of coal more per acre is obtained.

The result of the two systems in the proportions here shown is little short of astounding. No doubt, as the President of the Institute remarked, the old system must have been "very barbarous," and the loss can be only slightly relieved by the possibility of thinning some of the pillars left by that system. But so great a gain can have ensued only where the quantity left in the pit is hardly appreciable. Turned into statute weight, the figures show that Mr. GETHING is getting 13,090 tons per acre. This, the President states with confidence, is the largest yield on record in England or Wales. It is unquestionably an immense yield, and because of it Mr. GETHING well merited the high eulogium passed upon his work by Mr. JONES. Many pits may not offer corresponding facilities, but there are numerous instances in which similar results might be obtained by adopting Mr. GETHING's plan of working. In the hope it may be so adopted we have adverted to it thus prominently. At a time when our fossil fuel is valuable beyond precedent, to devise a more economical mode of getting it, is not alone to increase the wealth of the nation; it is also to confer a boon upon mankind. How the first object is promoted will be inferred from the fact that the increase represents, at the current price of coal in South Staffordshire, an increased value per acre of £1,600. Super-added to all this, the system is accompanied with better ventilation; a great reduction in the hardest work that the collier performs; the necessity for employing a small number of boys; and, above all, greater safety of working. Hardly less remarkable than the yield is the circumstance that during nearly nine years only one life has been lost in this colliery, and that one out of the workings and in the gate road. We hope that very many colliery managers will find their way to the Monway Colliery, at Wednesbury, there to see for themselves what this Staffordshire man is doing, and to ascertain how far his method of working is applicable to the collieries of which they have the charge.—*London Mining Journal.*

Explosions from Blown-Out Shots.

This subject has been brought under the notice of the Midland Institute of Mining Engineers by Mr. J. WARBURTON, of Leeds, and stands for discussion at the next meeting of the Institute. The following is an epitome of Mr. Warburton's paper:—

The coincidence of blown-out shots and explosions has become so common an occurrence that it is scarcely anything more than looked upon as a consequence of a cause—that is, blown-out shot, cause; explosion, consequence.

It was formerly contended, and with some people is now, that before an explosion can take place, there must be another important contributory, viz., the presence of gas, fire-damp, or "light carburretted hydrogen gas." Yet so many explosions have happened where, according to very important and credible evidence this gas, previous to the explosion, did not exist, that these explosions have been, and still are, shrouded in much uncertainty and mystery, consequently, very unsatisfactory; confirmation of this may be seen from the many and varied hypotheses set up as probable causes of these unaccounted-for explosions. None is more prominent than the lamentable Oaks explosion, in 1866. Scarcely less important (except as to number) are the Haydock and Hindley Green, in 1868; the Highbrooks and Low Hall, in 1869; Brynn Hall, Pendleton and Pendlebury, in 1870; and in 1871, Seaham and Hindley Green again. These, with several others of less note, are, practically, unaccounted for, and all connected with blown-out shots. In a lecture I gave on "Coal" some time since, an abstract of which was published in the *Colliery Guardian*, early in 1871, on the subject of accidents, I said, "One of the great hindrances to lessening the number and effects of accidents is, that we do not sufficiently learn from those we unfortunately have." The

accidents and places previously named, and which I shall bring before you, are not dragged from the records of the past to exhibit and hold up to the present readers, but for the sole purpose of sifting their alleged, and, if possible, ascertaining the true cause, and thus remove from the profession the blot which this mysteriousness exhibits. Not dating further back than the Oaks, we will first consider that. The verdict of the jury says, "That R—— H—— and others were killed by an explosion of gas or fire-damp . . . but there is no evidence to prove where or how it ignited." Mr. Dickinson says, "As to how the fire-damp became lighted no clear evidence has been adduced." What are the inferences then? It was after one o'clock when the explosion took place. The pit had been at work from early morn and gone on all right till then, but, says Mr. Dickinson, "there was no doubt from the evidence that the explosion took place when a shot was being fired." It is shown that this shot or powder did not do the work it was intended it should, but blew the bottom of the "hole" out into another road, thus liberating itself from the rock, and expending its force on the air. Mr. Dickinson says, "The effect of such a large charge of powder fired in that part of the mine would be a considerable concussion in the air." The shot was lit very far from the working faces, and a long distance from any place where gas was accumulated, but, says a witness, "in about the space of time it would take to count two, after the shot, came the great explosion." This space of time, small as it appears, contributes largely to the solution of the explosion, together with the direction from which the blast is said to have come. Three points require considering separately. (1.) A quantity of powder was put in a hole in some stone to do a certain amount of work, which, however, it did not do; but the powder was ignited, consequently its force was exerted and spent somewhere. (2.) On what, then, was this force or power spent? From what did this force receive resistance? (3.) How did this blown-out shot bring about such disastrous results?

(1.) The powder in this hole was considerable: the amount of force it would exert is rather difficult of calculation, and especially as the important elements in a calculation of this kind are wanting, one of the most important being the exact conditions of its discharge or liberation from the stone at the side it blew through, and the amount of its energy expended in bursting out the bottom and coming through. Of one thing there seems no doubt, from the loud report and its consequences, a very small proportion of the energy of the powder was spent in the rock. Some idea of the force of powder may be gathered from experiments that have been recently made. When under pressure, it was found to be equal to a force or power of nearly sixteen tons on the square inch of the hole containing the charge. That this force was not spent in the hole is very clear.

(2.) On what, then, was this force spent? On the "atmosphere of the mine." When the ignition of a pound of powder in a cannon will send a ball of seven pounds weight a distance of 1,800 yards, and, at the point of exit from the mouth of the cannon, be at the rate of 1,467 ft. per second, what may we suppose the force of this powder when it struck the atmosphere? What, in figures, I cannot say; but it would strike with a force of many tons. What, then, would be the atmosphere of the mine about the vicinity of this blown-out shot? We may take it as pretty nearly good atmosphere, composed of oxygen and nitrogen, with a small proportion of carburetted hydrogen from the coal ascending the downcast shafts and that in corves between the pits and the blown-out shot. This would be the character of the atmosphere struck by the force of the ignited powder. This strong, quick blow would set at nought the law of diffusion of gases. The atoms of each separate gas would set off at different velocities, according to its specific gravity—the lighter at a speed far quicker than those of greater gravity. And I am not so sure that another law would not take place, to increase the velocity of the light carburetted hydrogen, viz., that of "absorption", as it is very high in this gas, being per 100—air 1—carburetted hydrogen about 400—so that it is more than possible the velocity of the atoms of this gas would be greatly augmented by the heat absorbed from the flame of the powder. But to return to the different velocities according to gravities. The atomic velocities at atmospheric pressure and a temperature of 32 degs. Fahrenheit have been ascertained to be very nearly as follows:—

Oxygen	1,514	feet per second.
Nitrogen	1,616	" "
Carbon	1,885	" "
Hydrogen	6,050	" "

This is the difference of velocity at a pressure of 15 lbs. What must be the difference at such a pressure as would be given by the force of the exploded powder? Enough, I think, to account for the aggregation of sufficient atoms of carbon and hydrogen to bring the atmosphere up to an explosive point, where, previous to the sudden transmission of the atoms of carbon and hydrogen, it was not so. (3.) This, I think, accounts for the explosions happening at the time of blown-out shots, and will relieve us from the often resorted to "outbursts of gas." Further looking at the plan of the Oaks and the direction the blast is said to have come, we may reasonably infer that the gas was fired or ignited in the workings of either the "Dip South Level" or the "New South Level," or in both of them simultaneously; and no kind of lamps could withstand such velocities as would be given to the atoms of the various gases under such a pressure as would be given to them by the force of such an amount of powder. It would swell this paper beyond the limits of my desire to recapitulate the evidence of the many explosions that have taken place from blown-out shots, but may be read with interest in the reports of H.M. inspectors of mines. I will only notice two more. Low Hall, 1869. On page 40, Mr. HIGSON says, "whether the gas had been an accumulation through neglect, or a sudden and unexpected outburst, I have not yet been able to ascertain, etc. From the evidence, however, of the firemen, corroborated by many of the workmen, all the places were said to have been carefully examined only a short time previous to the explosion, and pronounced clear of gas and perfectly safe; shortly after this the shot lighter ignited several shots, and subsequently the shot that blew out, which, without doubt, ignited the gas." You will perceive the pit had been just previously examined and found safe, several shots had been fired, but not till the blown-out one was fired did the explosion happen. How can this be accounted for in any other light than that I have ventured to propound in this paper?

The other case mentioned by Mr. WARBURTON, is the Seaham, which we omit, having already given enough to illustrate his theory that "bad air" may, in some cases, be a product not of the coal but of the gases from blown-out shots, which gases are separated by virtue of their different velocities when subjected to the same force.

Dynamite is now made in Scotland. The first ton was made last week at the Ardeen Works, Scotland. The manufacturers of dynamite in France are agitating for the prevention of a monopoly or heavy impost levied upon it.

MINING SUMMARY.

Utah.

LITTLE COTTONWOOD DISTRICT.

From the Salt Lake *Tribune* of April 12.

The miners have almost all broken up their winter quarters, and prospecting has been partially resumed. The roads are as yet almost impassible on account of the deep slush and mud. The "raw-hide train" has been freely used and proved of great benefit in the transportation of ores and supplies. A scene of activity and bustle among miners, merchants and all classes is already visible, and cheerful countenances have taken the place of the gloomy looks which have been the rule during the late winter months.

THE EMMA MINE

Has been employing a full force of men all through the month, and there is a large amount of ore ready for shipment. The average product has been about forty tons daily, which could have been increased to three times the amount if transportation for the ore could have been obtained. It is reported that another large body of ore has been struck many feet below the lowest level, of a quality equal to any other yet found, and in quantity greater than the immense body from which such vast quantities have been shipped. Mr. WARREN HUSSEY has retired from the position of Resident Manager, and has been succeeded by Mr. GEORGE ATWOOD, an experienced and well-known miner in California and Nevada, and for some time connected with the management of the famous Comstock lode.

THE FLAGSTAFF MINE

Has also been working a large force. The average production during the month has been about fifty tons daily, and it is proposed to increase the same to one hundred tons. The mine appears to be as promising as ever. There is a large quantity of ore sacked at the mine, and the ore-house is quite full. Heavy shipments will commence so soon as the roads are in a condition to permit of transportation.

THE VALEJO MINE

Has a large quantity of ore on hand. The daily production has averaged fifteen tons. The mine is working well, and the prospects are all that the owners could wish. It possesses great advantages over other mines as regards transportation on account of the iron tramway which enables them at all times and seasons to ship ore from the mine to the ore-house, the depth of snow being no obstacle.

THE WELLINGTON MINE.

The new discovery reported in our last month's Summary has proved to be a large body of high grade ore, unquestionably a continuance of that in the upper level. Work upon the mine has been resumed with vigor and a large force of men employed. A contract has been made to deliver fifteen tons of ore daily for sixty days. A tunnel is being run to strike the vein 350 feet below the out-crop. Over three thousand sacks of ore are ready for shipment.

THE DAVENPORT MINE.

The tramway belonging to this mine has been thoroughly overhauled, put into first-rate working order, and gives great satisfaction. Seventy-five tons of ore can now be daily shipped by this means. The mine has greatly improved in appearance, and when all the necessary appliances and force are brought to bear, can be made to yield one hundred tons daily. The number of workmen has been gradually increased through the month, and about fifty men are now employed. Large quantities of ore are being taken out, and the shipments during the month have been close upon five hundred tons.

THE UTAH WINDSOR MINING COMPANY,

Owing the Hiawatha, Last Chance, and Montezuma, and Savage mines, continue to work a full complement of men, with the same satisfactory results as heretofore. When the roads are open and free egress can be had, a larger force will be employed, which will, of course, increase the results. Some five thousand sacks of ore are stored and ready for shipment.

THE REED AND BENSON MINE

Has a dozen or fifteen men employed, and a large amount of prospecting is being done. The owners feel very sanguine regarding the future, the vein having been found to be five feet thick at the bottom, and the ore of a very rich quality, which is enough to justify the assumption that it is a mine of great promise. There are three thousand sacks of ore stored and ready for shipment.

THE HIGHLAND CHIEF MINE.

An incline shaft is down one hundred feet, and the vein is traceable all the way down. Work on a tunnel, to strike the ore at a great depth, is being prosecuted. The width of vein averages from two to five feet.

THE STOKER MINE.

An incline shaft is down one hundred and eighty feet, showing a body of ore all the way of great value. The vein varies in width from one to four feet. This mine is principally owned by parties in Salt Lake City, who propose to push on the work with alacrity.

THE MONITOR AND MAGNET MINE.

This mine has been recently sold under an execution for $11,000. The purchaser is THEO. F. TRACY, Esq., agent for WELLS, FARGO & CO.

THE FOLLOWING MINES

Are reported to be showing well, and further developments have been made: Sedan, Peruvian, Louisa, Royal George, Darlington, Congress, Highland Chief, Revolution, and Topeka.

THE GLADIATOR TUNNEL.

This tunnel is now in upwards of four hundred and seventy feet. The character of ore has changed for the last twenty feet, it being now soft and decomposed, and easily worked. The indications are that a body of ore is in close proximity. The location of the tunnel is one of the best on Emma Hill, being between the Emma and Flagstaff, and near the North Star mines.

THE DAVENPORT AND MATILDA CONSOLIDATION.

Both the tunnel and shaft are looking well, and preparations are being made for extensive operations. It is calculated that with a full force of men, at least fifty tons of ore can be daily produced.

THE COAL TRADE.

NEW YORK, April 24, 1873.

Some companies report a better feeling among country dealers in regard to purchasing and the increase of price with the evident determination on the part of producers to demand henceforward rates which will make coal mining a paying business, has probably lessened the disposition to wait for a lower market. Still there is one class of dealers who seem to be looking to the Scranton sale as a possible ark of safety. But we fear they will find themselves disappointed in looking to the auction sale as a neutralizer of the determined course of the great companies. Still their course keeps trade from being active, though it has improved somewhat on last week.

The following are the prices for the coming month. Wilkesbarre Company:

Lump	$4.55
Steamer	4.65
Broken	4.75
Egg	4.90
Stove	5.10
Chestnut	4 55

The Lehigh Coal Exchange:

Lump	$5.35
Broken	5.20
Egg	5.20
Stove	5.35
Chestnut	4.65

The Lehigh Coal and Navigation Company:

	Old Co's Lehigh,	Room Run,	Plymouth.	Newport.
Lump	$5.50	$5.35	$	$
Broken	5.35	5.20	4.85	4.85
Egg	5.35	5.20	5.10	5.00
Stove	5.40	5.35	5.30	5.20
Chestnut	4.70	4.65	4.60	4.60

Deliveries via Canal, alongside at New York, 35 cts. additional.

Pennsylvania Company:

Lump	$4.50
Steamer	4.50
Grate	4.60
Egg	4.70
Stove	5.00
Chestnut	4.50

Philadelphia and Reading Company:

	Lump	St'mer	Broken	Egg	Stove	Ches't
Hard White Ash Coal	$4.10	$4.10	$4.20	$4.20	$4.40	$3.55
Free Burning White Ash Coal	4.10	4.10	4.20	4.20	4.40	3.55
Schuylkill Red Ash	"	——	——	4.25	4.40	4.60	3.75
Alaska Red Ash	"	——	——	4.20	4.20	4.40	3.55
Shamokin White Ash	"	——	——	4.55	4.70	4.70	4.00
Shamokin Red Ash	"	——	——	4.55	4.70	4.70	4.00
North Franklin	"	——	——	4.60	4.75	4.85	3.75
Lorberry	"	——	——	4.75	4.75	4.75	4.00
Lykens Valley	"	——	——	——	5.60	5.60	4.35

Canal freights to New York in Company's boats, $1.15 alongside. This Company gives notice that on and after May 1st, and until further notice, a drawback of thirty cents per ton will be paid on all Anthracite coal shipped from Port Richmond.

The Bituminous Trade.

Trade is active, so active that Cumberland coal is all sold off. Province coals are in active demand. Freights are opening and vessels arr chartered at $4. The gas coal companies are nearly sold up, and a scarcity towards the end of the season is predicted.

Anthracite Coal Trade for 1872 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending April 19, 1873, compared with the week ending April 20, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
*Phila & Reading R.R†	95,595	1,271,503	111,683	1,456,943
*Schuylkill Canal	32,528	92,498	18,589	53,590
*Lehigh Valley R. R.	63,6 9	1,096 785	67,177	1,074,937
Lehigh & Sus. R. R.	39,882	436,459	35,482	552,603
" " Canal	21,319	29,863	10,742	10,742
Scranton North	10 190	181,819	12,753	191,707
" South	47,359	624,221	57,531	628,346
Penn. Coal Co., rail	29,764	308,407	28,793	258,456
" " " canal	....	....	1,148	1,148
Del. & Hud. C.Co. Canal	5 892	16,589	21,645	25,615
" " East	14,398	190,739	9,024	113,670
" " West	....	101,283	4,593	119,936
" " South	8,289	104,833	5,515	98,107
Shamokin	7,430	126,926	9,157	142,245
Trevorton	....	....	....	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	....	....	....
P. N. Y. C. & R. R. Co.	10,444	198,639	13,288	211,873
Williamstown Col'y	....	....	....	....
Big Lick Col	....	....	....	....
Total	385,719	4,773,659	391,718	4,930 078
1872			385,719	4,773,659
Increase			13 999	156,379
Decrease				

These figures are for the week and fiscal period commencing Nov. 30.

† Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1872 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending April 19, 1873, compared with week ending April 20, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	18,677	82,767	19,636	58,048
B. & O. R. R.	28,284	325,954	30,590	385,798
Penn. S. Line	....	.....	2,911	31,737
H. & B. T. R. R.	4,456	67,940	10,836	131,201
*Harrisburg & D.	6,956	164 740	7,195	109,875
*L. V. R. R.	404	11,195	647	10,284
P. & N.Y.C. & R. Co.	8,338	119,217	6,749	98,613
Cumberl'd Branch Canal	6,530	26,849	4,230	11,624
" Railroad	814	2,041	330	32,271
Total	74,459	820,703	83,133	869,455
			74,459	820,703
Increase			8,674	48,752

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending April 19—Compared with same time last year.

REGION SHIPPED FROM.	TIDE. tons ct.	LOCAL. tons ct.	CANAL. tons ct.	TL. WEEK tons cwt.	TL. DATE tons.cwt.
Wyoming	24892 18	6749 02	2607 06	34249 06	485868 10
Upper Lehigh		2811 12	1294 05	4105 17	60308 00
Beaver Meadow	921 09	226 08	45 13	1193 10	51981 12
Hazleton		317 17	354 18	672 05	4679 04
Mauch Chunk	1175 16	3487 09	4297 00	8960 05	121358 04
Total	26990 03	13592 08	8598 12	49181 03	724165 10
Prev'ly reported	349656 02	320544 15	4783 10	674984 07	
Total to date	376646 05	334137 03	13382 02	724165 10	
Same time 1872	301355 02	218695 03	18556 18	538607 03	
Increase	75291 03	115442 00		185558 07	
Decrease			5174 16		

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	26990 03	28996 03	376646 05	301355 02
Forwarded East by Rail to Local points	6957 00	9564 17	148862 17	99246 05
Forwarded East by Rail use Central Division	1535 08	1338 17	27093 17	23018 06
Forwarded East by Rail use L. & S.	266 02	176 13	4283 06	2857 12
Delivered at and above Mauch Chunk	1058 05	1113 07	25261 01	16893 07
Delivered at Coalport & Hazard for Canal	8598 12	13679 12	37855 09	31395 19
Delivered to L. V. R. R. at Packerton	179 04	440 06	11800 12	4967 02
Delivered to L. V. R. Rd. at Sugar Notch			25553 06	
Delivered to L. & B. R. R.at Plymouth Bridge	3596 09	2682 12	66805 17	58973 10
Total	49181 03	57992 07	724165 10	538607 03

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending April 19, 1873.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received:				
From Lehigh Valley R. R.	7,795	01	130,291	17
" Lack. & B. R. R.	632	05	11,322	08
" Pleasant Valley R. R.	4,419	17	58,152	16
" Sul. & Erie R. R.	441	00	12,105	13
Total	13,288	03	211,872	14
Same time last year	10,443	12	198,699	06
Increase	2,844	11	13,173	08
Decrease				
Distributed:				
To Lehigh Valley R. R.	2,814	15	15,228	01
To Lack. & B. R. R.	27	17	413	17
To S. Central R. R.	241	00	40,928	07
To Ithaca & A. R. R.	189	04	31,884	17
To Erie R. W. Pockets for shipm't.	8,734	00	72,448	14
To individuals on line of road	148	06	15,172	09
To points at & above Coxton for use of Co.	155	09	10,638	05
To points between Waverley and Elmira	974	12	25,168	04
Total	13,288	03	211,872	14
Bituminous received from BARCLAY R. R.				
Shipped north from Towanda	6,684	15	97.955	05
Shipped south from Towanda	64	15	657	08
Northern Central R. R.	....		.....	
Total	6,749	10	98,612	13
Same time last year	8,337	15	119,216	16
Increase	.....		.....	
Decrease	1,588	05	20,604	03
Distributed:				
To Erie Railway	6,651	19	82,861	10
To So. Central R. R.	32	16	14,941	09
To Ithaca Valley R. R.	....		117	09
Lehigh Valley, R. R.	64	15	340	01
To individuals on line of Railroad.	....		.....	
To points on line of road for use of Company	....		118	04
Total	6,749	10	98,612	13
Grand totals transported				
Anthracite	13,288	03	211,872	14
Bituminous	6,749	10	98,612	13
Total	20,037	13	310,485	07
Same time last year	18,781	07	317,916	02
Increase				
Decrease	1,256	06	7,430	15

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending April 18, 1873.

	Tons.	Cwt.	Tons.	Cwt.
East	2,505	01		
West	6,648	08		
			9,153	09
Same time last year			7,450	10
Increase			1,702	19
Decrease			.....	
Total amount shipped to date			149,245	08
Same time last year			126,925	18
Increase			15,319	10
Decrease				

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, April 19th, 1873.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	30,631	03
" Port Carbon	4,383	07
" Pottsville	2,529	04
" Schuylkill Haven	34,476	15
" Pine Grove	7,045	15
" Tamaqua	14,635	15
" Harrisburg	9	10
" Dauphin	4,785	02
Total	98,496	11

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	6,566	16
" Mill Creek "	1,511	10
" Schuylkill Valley Scales	410	10
" Mt. Carbon "	1,157	02
" Cressona "	6,323	12
" Pine Grove "	.....	
" Tamaqua "	159	00
Total	16,128	10

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	92	05
" N. C. R. R. passing Locust Gap	1,761	08
" " " Shamokin	2,711	19
" " " Herndon	.....	
Total	4,565	12

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,078	09
" Lebanon & Pine Grove Branch	910	04
Total	1,988	13

CONSUMED ON LATERALS.

From Frackville Scales	652	01
" Mill Creek "	720	12
" Schuylkill Valley Scales	964	03
" Mt. Carbon "	642	18
" Cressona "	368	03
" Pine Grove "	12	13
" Tamaqua "	671	16
Total	4,032	05

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	826	17
Cat. & Wpt. Br. Sent West	.....	
" " Rupert, Cat. & Wpt. Br.	68	11
" " Allentown, E. Penn'a Br.	33	18
" " Alburtis, " "	.....	
" " Oreland, G. & N. Br.	806	09
" " Willow Street R. R.	865	00
Total	2,600	15

BITUMINOUS.

From Harrisburg	7,174	18
" Connecting R. R., G. & N. Br.	.....	
" Junction R. R.	20	00
Total	7,194	18

COAL FOR COMPANY'S USE.

Anthracite	7,575	10
Bituminous	172	13
Total	7,748	03

RECAPITULATION.

	Total for Week.	Corres-p'g week last year.	Increase and Decrease.	
Passing over Main Line and Leh. Val. Branch	98,496 11	83,967 02	i	14,529 09
For Shipment by Canal	16,128 10	33,145 05	d	17,016 15
Shipped Westward via Northern Central R. R.	4,565 12	4,473 02	i	92 10
Shipped West or South from Pine Grove	1,988 13	2,220 18	d	232 05
Consumed on Laterals	4,032 05	3,486 15	i	546 10
Lehigh and Wyoming Coal	2,600 15	1,446 14	i	1,154 01
Total Anthracite paying freig't	127,892 06	128,739 16	d	927 10
Bituminous	7,194 18	6,955 15	i	239 03
Total of all kinds paying freig't	135,007 04	135,695 11	d	688 07
Coal for Company's use	7,748 03	4 923 13	i	2,824 10
Total Tonnage for Week	142.755 07	140 619 04	i	2,136 03
Previously this year	1633827 09	1543695 19	i	90,131 10
Total to date	1776582 16	1684315 03	i	92,267 13

SHIPPED BY CANAL.

From Schuylkill Haven	18,242 00	31,651 00	d	13,409 00
" Port Clinton	347 00	2,337 00	d	1,970 00
Total Tonnage per Week	18,589 00	33,988 00	d	15,399 00
Previously this year	35,001 10	66,171 09	d	30,169 19
Total to date	53,590 10	99,159 09	d	45,568 19

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, April 19th, 1873.

	WEEK.	SEASON.
North	34,804 15	678,218
South	5,515 08	98,107 03
Total 1873	40,420 03	776,325 11
Corresponding time in 1872:		
North	43,730 01	727,353 15
South	8,288 19	104,831 18
Total	52,019 00	832,185 13
Increase North		
Decrease North		
Increase South		
Decrease South		
Increase	11,598 17	
Decrease		55,860 01

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday April 19, andduring the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l Tons. Cwt.	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt.	Total. Tons. Cwt.
1873	19.6 6 01	3 ,590 05	2.911 10	53 137 19
1872	18 676 13	28,284 07	....	46.961 06
Increase		2.305 18	2.911 10	6,176 13
Decrease	959 05	.....	....	

YEAR.

1873	58,047 15	285,797 17	31,737 08	475.582 00
1872	82 767 10	325,954 11	....	408,722 01
Increase	....	59 843 06	31,737 08	66,860 19
Decrease	24,719 15	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873	4 239 07	330 13	4 570 00
1872	6,529 18	814 02	7,344 00
Increase	....	....	.....
Decrease	2,290 11	483 09	2,774 00

YEAR.

1873	11.623 18	32 270 13	43.894 11
1872	26,848 04	2,040 12	28.888 16
Increase		30,230 01	15,005 15
Decrease	15,224 06		

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, April 19, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	12,753 08	191,706 15
Shipped South	50.532 19	628,345 17
Total	63,286 07	820,052 12
For the Corresponding time last Year :		
Shipped North	10,190 11	181,849 09
Shipped South	47,368 17	624,221 02
Total	59,459 08	806,070 11
Increase	5,736 19	
Decrease	.....	13,982 01

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending April 19, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	28,082 12	258,546 01	28,764 00	308,406 12
" Canal	1,147 14	1,147 14	.....	
Total	29,240 06	259,693 15	28,764 00	308,406 12
Decrease 1873	48,712 17			

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, April 19th, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	21,645	25,645
By Railroad, East	9,024	115,670
" West	4,893	119,936
" South	5,515	98,107
Total 1873	41,077	357,358
Corresponding time in 1872 :		
By Delaware and Hudson Canal	5.892	16,589
By Railroad, East	14,398	190,739
" West	....	104.283
" South	8,289	104,833
Total	28,579	416,443
Decrease	59 085	

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending April 19, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	30,587 05	262,055 08
" Hazleton	43,933 01	647,137 02
" Upper Lehigh	5 07	1,700 13
" Beaver Meadow	8,535 11	220,144 02
" Mahanoy	9,513 25	137,816 03
" Mauch Chunk	69 19	1,711 17
Total	92,704 18	1,270,565 05
Same time last year	82,831 18	1,269,225 17
Increase	9,873 00	1,339 08
Decrease		
Forwarded East from Mauch Chunk by rail	67,176 13	1,064,937 00
Same time last year	63,608 16	1,086,785 08
Increase	3,567 17	
Decrease		21,848 08

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail	65 925 01	1,043,254 13
do East for use L. V. R. R.	1,251 12	21,682 07
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,078 07	26,356 00
To P. & N. Y. & R. R.	7,795 01	130.291 17
To N. C. R. R., at Mount Carmel		3,598 12
To D. H. & W. R. R.	293 19	14,664 04
To L. & S. R. R. at Packerton for rail	338 17	5,727 07
Delivered at M'h Chunk	65 17	1,471 07
Delivered on line of road above Mauch Chunk	521 00	6,852 14
To L. & S. R. R., at Penn Hav., for railroad		1,541 10
Do. for canal	400 08	400 08
To Lehigh Canal Mauch Chunk	849 18	8 49
To Catawissa Railroad		35 00
To L. & B. R. R. at Lack. Junc.	14,185 08	14,339 18
Total	92,704 18	1,270,565 05

Lehigh Canal Coal Trade.

Shipped for the week ending April 18, 1873.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Total from Mauch Chunk Region	3,748 09	3,748 09
" " " " Hazardville		
" " Beaver Meadow Region	572 01	572 01
" " Mahanoy Region	277 07	277 07
" " Hazleton Region	400 08	400 08
" " Upper Lehigh Region	968 07	968 07
" " Wyoming Region	4,775 02	4,775 02
" " " " Hazardville		
Total	10,741 14	10.741 14
Corresponding week last year	21,318 16	29,868 02
Increase		
Decrease	10,577 02	19,126 08

Prices of Coal by the Cargo.

(CORRECTED WEEKLY.)

SCHUYLKILL.	AT NEW YORK. April 24. R. A.	W. A	AT PHILADELPHIA. April 24. R. A.	W. A.
Lump	$— —	$5 35	— —	4 00
Steamer	— —	5 35	— —	4 00
Broken	5 60	5 35	4 75	4 00
Egg	5 75	5 50	4 40	4 15
Stove	5 95	5 65	4 60	4 30
Chestnut	5 10	5 85	3 75	3 50
Pea	— —	— —	— —	— —
LEHIGH.				
Freight to New York 50 cents.				
Lump, (on board)	— —	5 25	— —	— —
Broken	— —	5 20	— —	— —
Egg	— —	5 20	— —	— —
Stove	— —	5 60	— —	— —
Chestnut	— —	4 25	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS *				
Honey Brook, Le'h W. A.	4 60@5 50		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Loaf " "	— —@— —		— —	— —
Room Run " "	4 60@5 50		— —	— —
Hill & Harris " "	4 60@5 50		— —	— —
Shamokin " "	4 60@5 50		— —	— —
Lykens Valley " "	4 75@6 00		— —	— —
Broad Top " "	6 50@— 00		5 25	— —

Company Coals.

April, 1873.

	L.	Str.	Grs.	Eg.	Sto.	Chest
*Scranton at E. Port	4 25	4 25	4 45	4 65	5 60	4 25
Pittston at Weehawken	4 70	4 70	4 70	4 90	5 40	4 60
*Lackawana at Weehawken	4 60	4 70	4 80	5 65	5 50	4 60
Wilk'b're at Hoboken	4 45	4 65	4 80	5 60	5 35	4 45
Old Co. Lehigh at Pt. John'n	5 50	—	5 30	5 30	5 45	4 60
Lehigh at Eliz. Port	5 00	—	4 75	4 75	5 10	4 15

For freights to different points see "Freights."
*To contractors only.

Prices at Baltimore—April, 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 75@6 00
Pittston and Plymouth, do	5 50@5 75
Shamokin Red or White Ash, do	5 50@5 75
*Lykens Valley Red Ash, do	....@5 80
By retail, all kinds per ton of 2,240 lbs	7 50@8 00
*George's Creek and Cumberland f. o. b. at Locust Point for cargoes	....@5 00
Fairmont and Clarksburg gas f. o. b. at L. Point	6 50
Kanawha Cannel, coarse	@12 00

* Freight to New York $2 15.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	....
Tyrconnel f. o. b.	$7 00

Prices at Georgetown, D.C., and Alexandria, Va.

April, 1873.

George's Creek and Cumberland f. o. b. for shipping $4 60@4 75

Prices at Havre de Grace, Md.

April, 1873.

Wilkesbarre and other White Ash for Cargoes	$ @....
Lykens Valley	@....
Shamokin Red or White Ash	....

Bituminous Coals (Cumberland).

Georgetown, F. o. b.	$4 60
Baltimore "	5 00
New York "	7 25
South Amboy "	6 75

Prices of Foreign Coals.

April, 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Caking	— —@— —
" " Cannel	17 00@— —
" House "	22 00@23 00
" Orrel	19 00@— —

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$20 00@22 00
"Cannel, "	23 00@25 00

Per ton 2.000 lbs. delivered.

Prices of Gas Coals.

April, 1873.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

	Coarse	Slack.
Block House	$2 50	$1 00
Gowrie	2 50	1 00

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal,
Pictou nett	$2 50	1 50
Sydney	2 50	1 00
Lingan	2 00	1 00
Caledonia	2 00	1 00

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm : 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale : 75 cents per ton of 28 bushels.

AMERICAN.	Nominal quo Currency.
Westmoreland f. o. b.	$6 50 @7 00
Fairmount Gas Coal Co. of N. Y	6 50 @7 00
Despard Coal Co	6 50 @7 00
Penn	6 50 @7 00
Newburg Orrel Gas	6 50 @7 00
West Fairmount Gas Coal	6 50 @7 00
Redbank Cannel, Penn	6 50 @7 00
AT PHILADELPHIA.	
Westmoreland	6 50 @7 00

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1 75 Shipping at Pt. R., 20c., for use at Phil., $2 18 from Pt. Carbon.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R. R., N. J., Phillipsburgh to Elizabethport	66
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 23

MAUCH CHUNK TO PORT JOHNSTON.

L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	1 06
Shipping expenses	25
Wharfage	00
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	72
B. & D. R. R. / Cam. & Am R. R.	$1
Shipping Expenses	35
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 35

Freights.—April, 1873.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Philada.	Anthracite. From Elizabethport, Port Johnston, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout
Amesbury						
Bangor	3 75	4 00				
Bath	3 25	3 25				
Boston	3 25	3 25		2 00	2 25	2 30
Bridgeport	2 50	2 50		1 00	1 20	1 25
Bristol				1 40	1 60	1 65
Cohasset Nar'ows						
Derby				1 25		1 50
Dighton	3 25					
East Cambridge						
Fall River	2 75	2 75		1 40	1 60	1 65
Hackensack						
Hartford	3 25	3 00		1 50		1 75
Hoboken	2 25			50		65
Jersey City	2 25			50		65
Lynn						
Middletown				1 25		1 50
Mystic				1 25		1 45
New Bedford	3 50	3 00		1 40		1 65
Newburyport	3 25	4 25		2 20		
New Haven	2 50	2 50		1 00	1 20	1 25
New London	2 75	2 50		1 25	1 40	1 40
Newport				1 40	1 60	1 60
New York	2 00	2 00		50		65
Norwalk	2 75			1 00	1 20	1 25
Norwich	2 75	2 75		1 30	1 50	1 50
Pawtucket	3 00	3 00		1 50		1 75
Portland	3 25	3 25		2 00		2 25
Portsmouth, N. H	3 25	3 25		2 10		2 40
Providence	2 75	2 75		1 40	1 60	1 65
Rockport						
Saco						
Sag Harbor				1 20		
Salem	3 25	3 25		2 10		
Stamford				1 00	1 20	
Stonington				1 25		1 50
Taunton				1 90		
Warren				1 40		
TO RIVER PORTS						
Albany						
Catskill						
Cockaackie						
Coeyman's						
Cold Spring						
Fishkill						
Haverstraw						
Hudson	3 00					
New York vessels	2 00					
Nyack						
Poughkeepsie						
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy						
West Point						
Yonkers						

* And Towing.

St. Thomas	$— — Gold.
Martinique	— — "
Demerara	— — "
New Orleans	— — "
Mobile	— — "

Foreign and Provincial Freight

April, 1873.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 1-5 tons	$
Liverpool, 5 per cent primage	

TO NEW YORK.

Provincial.	
Sydney	$3 50
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 60
Little Glace Bay	3 50

TO BOSTON.	
Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

MARKET REVIEW.

NEW YORK, April 24, 1873.

IRON—The dullness prevailing for some time past for Scotch Pig, has been broken by the sale of 2@400 tons Eglinton, recent arrivals, said to be all from dock, and about 400 do. Glengarnock from yard on terms not made public, but understood at less than our quotations. These sales have been mostly to dealers and consumers, and have somewhat relieved the market of lots pressing for sale. The market, however, shows no activity, and with consumers wants supplied for the present trade is again dull; we note besides the above, a sale of 300 tons Glengarnock at $52, to be removed from the yard before 1st prox., and a small lot Coltness, $60. Gartsherrie is out of stock and the price is entirely nominal. American Pig is dull, but we do not alter our quotations, the market being firm. The decline in Scotch Pig has caused a better demand for No. 2 X, but the business is still light. New English rails are quiet and nominal. Old are without business excepting 100 tons F on private terms; we quote T. $55, and D. H. $57@$58. Scrap is dull at $50@$52.50 from yard. Manufactured is steady at a material decline. There is no Swedes Bar in Jobbers hands, and but a little in bond.

LEAD—There has been a large movement in Pig, the purchases embracing about 1000 tons, mostly Domestic, at 6½ cents, gold. Foreign is very firm at 6¾ cents for Ordinary, with an upward tendency, this price being about a half cent gold below the present rates ruling in Europe. 300 tons Spanish is being reshipped from importers' hands. Bar 9¼ cents, Sheet and Pipe 10½.

COPPER—New Sheathing is steady at 43 cents, and Bolts and Braziers 45, Bronze and Yellow metal Sheathing 27, and Y. M. Bolts 32, net cash. In Ingot, there has been little or no business; buyers are now likely to pursue the hand-to-mouth policy pending the opening of lake and canal navigation, when receipts of the new make will come forward; this will take place in about four or five weeks. Meanwhile, when copper is wanted, 33½@34 cents is paid for Lake, but where holders are anxious to realize it is difficult to obtain more than 33 cents. In English Pig there has been some business, say 50 tons B. S. at 30½@30¾ cents, 60 days. 3,000 lb. Old Copper sold at about 27½ cents.

SPELTER—Remains very quiet, but the present high cost strengthens holders, and Silesian may be quoted firm at 7¼@7⅝ cents gold. Domestic 10 cents currency.

STEEL—The market for all quoted descriptions is steady and firm at our late advanced quotations.

TIN—The market for Pig remains very dull, and, though holders abate their pretensions somewhat, there is no response from buyers. Straits is now generally held at 32½ cents, 30 days, English 32, and Banca 37½, all gold. Plates for a long time past have moved slowly, and prices, notwithstanding the firmness of makers in England, begin to feel the effect of the inaction; we reduce our quotations 25@50 cents per box gold. Good Charcoal Tin have sold as low as $11.75 gold. Sales have been made of 500 bxs. Charcoal Tin, in lots, at $12@$12.25 for I. C.; 500 do. Coke Tin, B. I., $10; 500 do. Coke Terne, $9.37½ (we quote now $8.50@$9.50, as to brand); and 250 do. Charcoal Terne, $10.75, all gold.

ZINC—Mosselman Sheet from agents' hands is steady at 10 cents, less 4 per cent. gold, with sales of 200 casks for arrival, at this price. Manganese black oxide 3½, do. gray peroxide 5½.

The following is from Messrs. BIGELOW & JOHNSTON, No. 48 Pine street, New York, April 24, 1873.

PIG IRON—American is generally firm at $50 for No. 1, though here and there parcels can be got at less money. In Scotch the trade has been at lower figures, and Glengarnock may be quoted at $52. At these prices importers loose money, and as the latest cable advices are more encouraging, we think a reaction not improbable.

OLD RAILS—Intensely dull, but no great quantity pressing on the market. We quote D. H. $54@$55, T's $52@$53

SCRAP IRON—Quiet and rather weak, $52½ ex yard.

NEW RAILS—Dull and quite nominal. All articles in Iron are more or less affected by the stringency in the money market.

Our Imports of Iron and Steel in 1872.

Dr. Edward Young, Chief of the Bureau of Statistics, Treasury Department, Washington, D. C., has courteously complied with our request in furnishing for publication the following statement of imports of iron and steel, and manufactures thereof, during the year ended December 31, 1872:

IRON AND STEEL, AND MANUFACTURES THEREOF.	QUANTITIES.	DOLLARS.
Pig Iron.....lbs.	591,934,780	7,269,850
Castings..... "	814,265	38,564
Bar Iron..... "	179,152,436	4,837,532
Boiler Iron..... "	1,369,158	59,993
Band, Hoop and Scroll Iron.... "	24,759,754	748,509
Railroad Bars or Rails of iron . "	762,128,379	14,498,012
" " " of steel. "	299,571,265	8,207,013
Sheet Iron..... "	29,293,000	1,263,112
Old and Scrap Iron.....tons.	248,444	7,617,463
Anchors, Cables, Chains, of all kinds.....lbs.	11,751,141	622,908
Hardware.....		325,208
Firearms.....		811,872
Steel Ingots, Bars and Wire.....		4,106,087
Cutlery.....		2,272,467
Files.....		676,814
Saws and Tools.....		476,927
Other manufactures not specified..		6,743,183
Total Imports.....		60,575,514

—(Bulletin American Iron and Steel Association.

METALS.

NEW YORK, April 24, 1873.

IRON.—Duty: Bars, 1 to 1¼ cents ₩ lb; Railroad, 70 cents ₩100 lbs.; Boiler and Plate, 1½ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ₩ lb; Pig, $7 ₩ ton; Polished Sheet, 3 cts. ₩ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ₩ ton	60 00@— —
Gartsherrie	58 00@— —
Glengarnock	53 00@— —
Eglinton	51 00@— —
Pig, American, No. 1	50 00@— —
Pig, American, No. 2	46 00@48 00
Pig, American, Forge	40 00@42 00
Bar Refined, English and American	— —@110 00
Bar Swedes, assorted sizes (gold	137 50@142 50
	Store Prices, Cash.
Bar, Swedes, 1¾ to 5 x ⅜ & ⅞ 2 sq. & 6 to 12 x ⅜ & ⅝	150 00@160 00
Bar, Refined, ⅝ to 2 in. rd. & sq. 1 to 6 in. x ⅝ to 1 in.	100 00@ — —
Bar, Refined, 1¼ to 6 by ¼	— —@105 00
Bar, Refined, 2¾ to 2⅞ round 1 & 1¾ by ¼ & 5:16	107 50@ — —
Large Rounds	110 00@120 00
Scroll	120 00@165 00
Ovals and half-round	125 00@145 00
Band	— —@117 50
Horse Shoe	— —@125 00
Rods, ⅝ to ¾-16inch	105 00@150 00
Hoop	125 00@172 50
Nailrod	9¼@ 9½
Sheet, Russia, as to assortment (gold)	16 @ 17
Sheet, Singles, D. and T. Common	—6¼@— 7¼
Sheet, D. and T. Charcoal	—7¼@— 8½
Sheet, Galv'd, list 5 per cent. discount	—@— —
Rails, English (gold), ₩ ton	70 00@ 71 00
Rails, American, at Works in Pennsylvania, currency	80 00@ 83 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ₩ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₩ lb	— @— 43
Copper Bolts	— @— 45
Copper Braziers, 16oz. and over	— @— 45
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	28 @— 30
Copper, Old, for chemical purposes, 14@16 oz	28 @— 39
Copper, American Ingot	33⅛@— —
Copper English Pig	—@— 30½
Yellow Metal, New Sheathing & Bronze	27 @— —
Yellow Metal Bolts	— @— 32
Yellow Metal Nails	27 @— 30

LEAD.—Duty; Pig, $2 ₩ 100 lbs.; old Lead, 1¼ cents ₩ lb. Pipe and Sheet, 2½ cents ₩ lb.

Galena, ₩ 100 lbs	$— @— —
Spanish (gold)	6 62½@6 75
German, do.	— @6 75
English do.	6 75 @7 12½
Bar.....(net)	9 25 @— —
Pipe.....(net)	— —@10 50
Sheet	— —@10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ₩ lb or under 2¼ cents; over 7 cents and not above 11, 3 cents ₩ lb; over 11 cents, 3½ cents ₩ lb. and 10 ₩ cent ad val. Store prices.

English Cast (2d and 1st quality) ₩ lb	— 18½@— 23
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 14 @— 18½
English Machinery	— 14½@— —
English German (2d an 1st quality)	— 12½@— 14½
American Blister "Black Diamond"	— — @— 11½
American, Cast, Tool do.	— — @— 17
American, Spring, do.	— — @— 11
American Machinery do.	— 11½@— 12
American German, do	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 25. ad val.

	Gold ₩ lb.
Banca	— @37½
Straits	— @32½
English	32 @32¼

PLATES.

Fair to Good Brands.	Gold.	Currency
I. C. Charcoal, ₩ box	$11 75 @12 25	$14 50 @14 75
I. C. Coke	8 75 @10 50	12 25 @12 50
Coke Terne	8 50 @9 50	10 25 @11 00
Charcoal Terne	10 75 @11 25	12 00 @13 00

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100lbs.

Plates, Foreign	(gold) p. 100 lb.	7 75 @—7 87½
Plates, Domestic	p. lb.	9 @—11

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per lb.

Sheet	per lb.—10½@11

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, April 24, 1873.

We have advices from the San Francisco Stock Board, dated the 17th and 22d, with but a few unimportant exceptions the market has advanced. Belcher leading the list, being $14.50 higher than our last. Belcher has declared a dividend of $5 per share, payable the 10th inst. Crown Point has declared a dividend of the same amount, payable on the 12th inst. The reports of the market are as follows:

	April 17.	April 22.
Savage	43	48
Crown Point	97	103
Yellow Jacket	60	65
Kentuck, "New Issue"	8	7¾
Chollar Potosi	41	40
Gould & Curry "New Issue"	7⅛	7¾
Belcher "New Issue"	71	83
Imperial	6¾	5⅝
Raymond & Ely	59	63⅝
Meadow Valley	12¼	13½
Eureka G. V.	—	24

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April 1:6m

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Importer and Manufacturer of all kinds of apparatus for mineral and chemical analysis. *Laboratory and Assaying Tools, Prospecting and Mining Implements, accurate* Balances and Weights, Furnaces, Tongs, Freiberg Scarifiers, French Cupels and Assay Cups. Flasks, Dippers, *Crucibles*, etc. Complete *Blowpipe* sets for gold and silver tests. Compasses, Becker's Ingot Moulds, Lenses, Evaporators, etc., etc.

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Price - $1 50 per Copy.

1y-apr8-73

THE CALCASIEU SULPHUR AND MINING COMpany of Louisiana, invites proposals for the construction of a shaft in Calcasieu Parish, State of Louisiana.

The object of said shaft is to reach a deposit of sulphur, about four hundred and forty (440) feet below the surface of the ground. The nature of the soil and thickness of strata are as follows:

First	160 feet of clay containing sand,
Second	170 feet of quicksand,
Third	110 feet of calcareous or limestone,

and next the sulphur bed, which is about one hundred and ten (110) feet thick.

The Company will exhibit a plan and specifications to tractors for said shaft, and has on the spot, iron rings, extraction engine and tools imported from Europe with the view of using the KIND & CHANDRON system, also a steam saw mill, abundance of timber, necessary buildings, &c., &c.

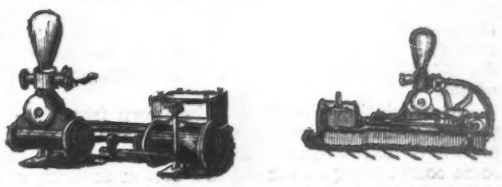
The work will be done under the supervision of the Engineer of the Company. Proposals will be received up to the 1st of July, 1873. Address

V. A. BÉLAUMÉ, Secretary,

3½ Carondelet Street, New Orleans.

GUILD & GARRISON,

manufacturers of Steam Pumps for all purposes, both Direct-acting and Balance-Wheel.



For sale at the Steam Pump Works, 34 to 44 First street Williamsburg, N. Y. 1y

On the Use of Lignites in the Blast Furnace.

By THOMAS M. DROWN.

In a recent number of the *Oesterreichische Zeitschrift für Berg und Hüttenwesen*, HACHSTOCK discusses the applicability of lignites to the blast-furnace process, particularly with reference to the lignites of Styria. He calls attention to the fact that it is not only necessary to consider the amount of non-combustible volatile matter and the amount of ash the fuel may contain, but also the behavior of the coal on exposure to heat; whether it simply loses its volatile ingredients without material alteration of form, or whether it breaks up into small fragments which might impede the passage of the gases in the furnace. An essential condition of success in the use of lignites is, moreover, that they should have, as far as possible, a uniform composition. Some lignites lose water largely on exposure, others less so. Varying degrees of exposure to the weather are accompanied by the loss of varying amounts of water. It is reasonable to expect, therefore, that irregularities in the working of a furnace would arise from the employment of a fuel, which varied 10 per cent. or more in the amount of water it contained.

The lignites of the Koflach beds contain but 40 to 45 per cent. of fixed carbon. HACHSTOCK recommends that a trial of this coal be made after drying thoroughly in ovens. In this drying process it loses about 40 per cent. of volatile matter, mostly water, while nearly all the tarry matter remains behind.

Iron assays made with this dried fuel in a Selfström's furnace gave results as quickly and satisfactorily as when made with charcoal. HACHSTOCK suggests that a small blast furnace be built to test practically the availability of this fuel for iron smelting. The furnace should be built so that such alterations could easily be made as experience in its working might indicate. The form of furnace he recommends for the purpose of experiment is a shaft 24 to 26 feet high, wide mouth, steep boshes and a narrow hearth, at least one-half of the diameter of the mouth. The furnace should be provided with a blowing engine capable of delivering 1200 to 1500 cubic feet of air per minute at a pressure of 36 to 40 lines of mercury. The blast should be heated to 300° Centigrade.

The question of the use of lignites in iron smelting is one that intimately concerns us in America, and must, ere long, be practically settled. The suggestions of HACHSTOCK are, therefore, opportune. Many of the lignites west of the Mississippi resemble in outward appearance the true bituminous coals. They contain but small amounts of sulphur and ash, burn freely and furnish an intense heat. The idea that they must necessarily answer as an excellent blast furnace fuel naturally suggests itself. That they will ultimately be used for this purpose there can be but little doubt, but it is none the less certain that *we must first learn how to use them.* The fact that all the lignites contain oxygen, or what amounts to the same, *water in the combined form*, apart from *moisture*, is one generally overlooked. It is this fact that renders the use of lignites in the blast furnace in some degree questionable.

Before we see new iron centers develop in Colorado and other Western States and Territories, there must come a season of patient experimenting, or else we may expect to hear of the total failure to use lignites in the blast furnace, which may retard the development of the western iron industry a generation. *Bulletin of the American Iron and Steel Association.*

The Probable Appreciation of Gold.

In regard to the value of gold in the future, opposite views have been maintained, supported by arguments of some weight on both sides. On the one hand, it is urged that the causes which produce depreciation are only beginning to operate, and a still greater decline in prices may be expected; and on the other side it is asserted that there are sure signs of a falling off in production, together with a probability of increasing demands, tending inevitably to an appreciation of the standard during the next twenty years.

The current supply of gold has been calculated to amount to about £20,000,000. The current demand is reckoned at £12,000,000, which is made up thus :—

English annual consumption	£5,000,000
Indian ditto	4,000,000
Australian ditto	1,200,000
South American ditto	1,000,000
Portuguese, Spanish, etc., ditto	800,000
Total	£12,000,000

Hence it appears that there is an annual excess of £8,000,000, which would produce depreciation if it were not absorbed by the extraordinary demands likely to occur. That there will be such demands for gold is very certain, and it is also most probable that the £8,000,000 will prove inadequate to meet them.

The demand for Germany is very urgent and of great magnitude. The Germans have decided to have a gold currency, and this means that within the next few years Germany must obtain, in round numbers, between £60,000,000 and £80,000,000 of gold. In 1872, in fact, Germany coined about £21,000,000, and she proposes to coin £18,000,000 in 1873. Germany is a good deal more populous than France, but France, twenty years back, took up about £200,000,000 of gold; therefore, to assume that Germany will use up half that amount, is no extravagant supposition.

Omitting minor demands, such as the Scandinavian, of an extraordinary character, it is necessary to count on great requisitions of gold for the United States and France in a not distant future, owing to the resumption of specie payments in those countries. It is probable that the decline of the German demand will coincide with the commencement of the demand for the United States, and that, by the time this latter is satisfied, France will come into the market as a large buyer of gold.

The conclusion, therefore, to be drawn from these arguments is, that for some years to come there will be a great demand for gold probably exceeding the supply; and, unless there be an improvement in the annual production of gold, or some compensation be found in a greater economy of existing stocks, it is reasonable to expect that, during the next decade, gold will rise in value.—*Iron.*

Mining Anemometers.

The mining anemometer advertised elsewhere by Messrs. J. W. QUEEN & Co. 601 Broadway, New York, is a convenient instrument for ascertaining the amount of air passing through a gangway or other space, by a moment's observation. A light fan wheel made up of twelve vanes, one inch in depth, is revolved by the current of air and the number of its revolutions is recorded on two small dials which mark tens and hundreds, the total reading up to 1000. When this is held up for a given space of time, say five seconds, the reading gives the velocity of the air in feet, which, multiplied by the section of the gallery or other passage, gives the cubic contents of air, per second or other selected unit of time. The instrument requires no adjustment since the difference between two readings is the proper total, or if adjustment is required it can be obtained by letting the wheel run until the zero point is reached. The rapidity with which observations can be taken must make the use of an instrument supplant the rude methods of estimating the velocity of air currents now in vogue, especially as the close inspection of mines is coming to be the rule. The law will not be satisfied with throwing up a feather but requires an answer in cubic feet. In coal mines where a higher responsibility for human life should govern the mine owner's action the use of the anemometer will not be delayed until the legal authorities come forward with their demands. Messrs. QUEEN & Co. have taken the right time to give prominence to this part of their business.

While on this subject we will say that the amount of air required for a human being varies very much with the conditions in which he is placed. PINZGER has made the following calculations, based upon the fact that the amount of air expired per minute by a full grown man is one sixth of a cubic foot; that this air contains four per cent. of carbonic acid; and that the fresh air mingles with the used air to a homogeneous mixture.

AMOUNT OF FRESH AIR IN CUBIC FEET PER HOUR FOR EACH PERSON.

	Ventilation in summer and with cold air in winter.	Ventilation with hot air.
In hospitals :		
For ordinary patients	2,000	3,000
For injured persons	3,500	4,000
During an epidemic	5,000	7,000
In prisons	1,500	1,800
In factories :		
Ordinary factories	2,000	3,200
Where the air is contaminated	3,500	5,000
In barracks with soldiers :		
By day	1,200	1,600
By night	1,500	1,800
In theatres	1,500	1,800
In halls when long occupied	2,000	2,500
In halls occupied a short time	1,200	1,600
In schools	1,200	1,600

Prices of Iron in England and America.

The relative price for iron in this country and England is now receiving a good deal of attention from British technical journals, and as some of them come to the conclusion that merchant bars are cheaper here than there, the importance of the subject is evident. There is, however, doubt on the subject. *Iron* says: "What is really the money difference between the prices of iron in England and in America? This is a question of vast importance to all in the iron trade, on its answer depending more than one arrangement as to wages of men, besides the maintenance of present prices in this country. A contribution to exact knowledge on this point is furnished by the following figures, obtained from a Liverpool shipping firm of high standing in the iron trade.

	£	s.	d.
Merchant bars at works in Staffordshire	14	10	0
Freight to Liverpool	0	10	0
Freight charges	0	2	6
Freight to New York	1	2	0
Insurance	0	1	6
Commission	0	6	6
Duty	4	14	6
Total	£21	6	6
Present selling price of American merchant bars, out of store, at New York, 105 dols	£18	17	6
Selling price of American bars at works in Pennsylvania, 90 dols	£16	6	

Thus the balance in favor of American iron is £2 9s. per ton. Evidently, as long as this is the case, Americans will prefer to encourage their own manufactures, and while demand will stimulate supply across the Atlantic, the reversed operation will probably be in progress here, and prices will fall.

Ryland's Circular, on the other hand, reaches a less alarming result. It says: "The price in New York of common bar iron from store is 105 dols., which would be perhaps equal in quality to that which Mr. GROUCUTT would be glad to supply at £12 10s. Taking the lowest estimate of the value of a dollar we get £19 4s. as the American price; by the addition of £6 15s. 6d. for freight, insurance, commission and duty charges, to £12 10s. at works here, we get a total for English common of £19 5s. 6d." The truth is that prices are too uncertain in England to make such calculations of very great positive value, and the fact that America can not yet produce all the iron it requires, is pretty certain to bring about greater or less equality of price, whatever the difference in cost may be.

Even this alarming subject has an amusing side. See how beseechingly *Ryland's Circular* appeals to the striking workmen: "We hope the men will see from the manner of our comments in this and other matters that we have no desire to be their enemies. Let the dead past bury its dead. Let us act in the living present. In the face of an impending danger we dare not do other than counsel the men to accept the offer of the employers. Their best friends advise the same. Iron-making just now, as Mr. CAPPER should know, is hampered with such restriction in the way of material that cannot afford to quarrel within itself."

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.
JOHN A. CHURCH, E. M. Editors.

PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.* It is the Organ of the American Institute of Mining Engineers, and is regularly received and read *by all the members and associates* of that large and powerful society, *the only one of the kind in this country.* It is therefore the best medium for advertising all kinds of machinery, tools and materials used by Engineers or their employees.

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The next meeting of the American Institute of Mining Engineers will be held in Philadelphia, May 20. This is the annual meeting and should call out the full strength of the Institute. The importance of these gatherings has increased with each one, and the Institute exerts upon the mining profession a consolidating and improving effect which cannot be overestimated. With all the changes which have occurred in the metallurgy of the country within the last few fruitful years, Pennsylvania has not lost the leading position which it has held so long, and a meeting in that State should draw to it the best work and the largest attendance which can be obtained in the country. It is too early yet to say what arrangements will be made for the conduct of the meeting, but communications on the subject can be addressed to the secretary, Dr. THOMAS M. DROWN, 1123 Girard street, Philadelphia.

Mr. A. G. HUNTER, of Detroit, offers in another column a large tract of land—200,000 acres—in the coal region of the Kanawha Valley, Virginia. The character of the coal in that State is a sufficient indication of the value of the Kanawha region to American iron industry. The splint coal is open burning, clean, sharp in fracture, and bears transportation well. It is made up of thin layers of bituminous and cannel coal, in alternation, and has long been used with great success in smelting. Its striking freedom from sulphur will have an influence upon the settlement of one of the great questions of the day in metallurgy—where the center of the steel industry is to be. The opening of the Kanawha coal will give an incentive to the development of the pure North Carolina ores and the combination of the two can well be an element of importance in settling the position of steel manufacture.

IT is tolerably certain that the next great work of geology in this country will be the thorough study of the Eastern coal measures. The movement made toward a revision of Pennsylvania geology we have already referred to. Whether that effort succeeds or not, that State and Virginia will probably, before long, be the field of a geological exploration which will have objects commensurate with the immense importance of the coal supply to this country. Individuals are already engaged in work that will be of the greatest value as preliminary to the heavier general task. Among them is Mr. JNO. J. STEVENSON, Professor of Geology in the University of New York, whose knowledge of the Barren Measures in particular, gives his work especial value. He lately published some Notes on the Geology of West Virginia, and we have also received a copy of a paper on the Coals of Kanawha Valley, read by him before the Lyceum of Natural History, in February last. We shall publish this next week. The field of which Prof. STEVENSON treats is undoubtedly destined to a very great importance in connection with the manufacture of iron in the United States. The development of the non-coking coals of Virginia and of the Pittsburgh bed in Eastern Ohio, comes at a time when it will exert a marked effect upon the course of what we may call the center of gravity of the iron industry. That center has lately stood a very good chance of being disturbed in the position it has so long occupied in Pennsylvania, by the establishment of important works along the Mississippi river, both north and south. But the coal of that region does not compare with that of the basins further east. Even to utilize it at all requires a metallurgical skill in a direction comparatively new to Americans, which they have not yet exhibited, though we have no doubt that they will soon exhibit it in a high degree. But in Ohio and Virginia a fuel exists which asks for no more than the old methods, and lying near it are deposits of ore which certainly equal the average run of ores in other parts of the country. That field is pretty certain to be the scene of large developments in the iron industry, and labors like those of Prof. STEVENSON, are the best opening for such developments.

SOME time ago the *Iron Age* answered our remarks denying the approaching exhaustion of the great German mining districts of the Harz, Mansfield and Freiberg, by re-asserting the fact and taking great credit to itself for publishing such important mining news in advance of a professed mining paper like this journal. We are quite willing to resign all the credit of first giving to the world information that is incorrect and founded in a thorough misconception of the circumstances, and as we had already sent to Germany for the figures of ore importation, we forbore answering until we could speak with authority. The statistics came and were published in our last issue, but unfortunately they did not give the comparison between the amount of home and foreign ores treated, which we hoped they would. We can only therefore give general figures, and those relate to Freiberg alone. In the first half of the fiscal year the product of silver at those works was about 60,000 pounds, of which about 40,000 pounds came from native ore. The production of silver from foreign ore was therefore 50 per cent., while the amount of such ore treated probably did not reach 25 per cent. of that from the home mines, and even this amount proves to be so embarrassing that importation of ore if continued, will require an extension of smelting-works. We have spoken of the "approaching exhaustion" attributed to these mines. All mines look forward to exhaustion earlier or later, and it will of course be earlier in proportion as the extraction is pushed. The life of a mine is so uncertain, that in many countries it is still impossible to estimate its duration. Those countries whose mining interests we are now discussing are, in fact, among the very few who can estimate the future with confidence. Mining there reaches back so far that its beginning may fairly be said to be lost in the mists of antiquity. For a hundred years its course has been minutely recorded, and though the Saxon miner can see no further beyond his pick than another, he feels a certainty that the mines which have never failed in their productiveness during so many centuries, are good for just the length of time he is able to work them. Not their fertility but his ability to extract it, is the limit of wealth they can give him. Approaching exhaustion means the sure on-coming of the time when the machinery of mines will be too ponderous to be economical. But the increasing economy in the use of fuel and the constant improvements in machinery, make the day of that exhaustion a constantly receding one; while the incessant perfecting and cheapening of metallurgical processes greatly increase the prospect of lengthened prosperity.

Few persons in this country entertain right views of the conditions under which mining industry exists abroad. The mistake is often made of supposing that the effect of the exhaustion of the German mines can be neutralized by the importation of foreign ores. The fact is that such an importation relieves not the mines but the smelting works, and the latter are the least element in the advantages which are sought in mining. A great number of mines are maintained which yield but a very small profit, others that just hold their own, and a large number (many times more than is commonly supposed) which have footed up a loss for the last century. Governments look upon mines not as sources of profit so much as elements of national strength. Mines of gold and silver prevent the exhaustion of hard metal currency, increase business, and maintain a population which both enhances the value of agricultural productions and furnishes soldiers when soldiers are needed. Add to this the fact that some small taxes are derived from the miners, and that much of the scientific advancement of the country receives a purpose and support from the mines, and we have given the sum of governmental advantages from mineral industry, so far as it is confined to the noble metals. Of direct pecuniary profit there is so little, that it may be left out of consideration. The leading value of the mines is the population they support, and in Freiberg this is at least eight times as great as the number which look to the smelting works for employment. It would therefore be of little advantage to the country to replace home ores with foreign ores, for that would be to throw the eight or ten thousand Freiberg miners out of employment, and take from the twenty thousand women and children dependent on them, their daily bread. It is not the importation of foreign ores but the improvement of mining machinery that the government strives to attain.

The facts mentioned above do not by any means militate against the supposition that the German authorities have in view a largely increased importation of foreign ores. On the contrary, there are signs which we have for some time interpreted as indicating a contemplated extension of the smelting works in

Northern Germany to enormous proportions. Undertakings of this kind proceed slowly there, and since a commission has been sent out to examine the mineral markets of the world, including, according to the directors of the Samana Bay Company, the renowned and so far worthless mines in Santo Domingo, from which the followers of Columbus drew such very large stories and so very little gold, we suppose that the officers in charge of the German smelting works are looking forward to the establishment in their country of works to which the whole world shall bring its ores. Certainly there is good reason for supposing that such an enterprise would be successful. Even England cannot compete with Germany, as the revelations of the mining companies' meetings in London this year sufficiently prove. The sterling reputation of the German works and their low charges will ensure them any supply of ore they desire; while the cheapness with which they can work will give them a good profit. Germany has it in her power to assume the same supremacy in the treatment of lead and copper ores that England has held so long in the manufacture of iron. We should not be surprised if the next five years gave birth to such a result.

The Production of Utah.

In the statement of the production of Utah, published last week from the forthcoming report of the Commissioner of Mining Statistics, an incorrect manuscript was followed, which does not quite agree with the report. The table we gave should be corrected as follows: The Miller bullion should be reckoned in currency, instead of coin value, giving for gold, silver and lead $291,840 instead of $273,730, and changing the totals of the first statement to $3,250,487 for gold, silver and lead, and $2,445,284 for gold and silver. This change increases by $18,110 only the amounts given in our last number. But an explanation, omitted there, is necessary to the complete justification of the estimates, namely, the amounts given as value of base bullion are the sums received in currency when the bullion was sold; but these currency amounts happen to have been, as nearly as can be ascertained, about the same as the amounts in coin value actually extracted. That is, the purchaser of base bullion last summer at Salt Lake at $150 currency per ton for the gold and silver contained, extracted about $150 coin value per ton out of it. Hence these currency figures have been accepted as coin, and added to the figures of the express shipments, etc., to obtain the total coin value of the precious metals actually added to the world's stock by the production of Utah in 1872. In other words, the miners and smelters received in currency about as many dollars as they gave the world in coin. The difference, plus the profits on lead, was divided between transporters and refiners.

New Rules for the Sale of United States Coal Lands.

The Commissioner of the General Land Office has just issued regulations under the act providing for the sale of United States lands containing coal, approved March 3, last, as follows: "Any individual, 21 years of age, and a citizen of the United States, or who has declared his intention to become such, may enter by legal subdivisions any area not exceeding 160 acres; any association may enter to the extent of 320 acres. Any association of not less than four persons who shall have expended not less than $5,000 in working and improving any coal mine or mines may enter not exceeding 640 acres. The price per acre is $10 where the land is situated more than 15 miles from any completed railroad, and $20 per acre where the land is within 15 miles of such road. In conflicts where improvements, etc., have been commenced subsequent to March 3, last, or shall be hereafter commenced, priority of possession and improvement shall govern the award when the law has been fully complied with by each party. A mere possession, however, without satisfactory improvements, will not secure the contract to the first occupant when a subsequent claimant shows his full compliance with the law.

The Bullion Product of Colorado in 1872.

From the forthcoming Report of the U. S. Commissioner of Mining Statistics.

By the courtesy of Hon. GEO. M. MCCOOK, Governor of the Territory, who has placed at my disposal the report of the Territorial Assayers; by the active cooperation of these gentlemen themselves, who, in view of this use to be made of their reports, exerted themselves to produce thorough and trustworthy discussions of the mining industry in their respective districts; by the earnest and judicious assistance of Mr. J. F. L. SCHIRMER, Superintendent of the Denver Branch Mint, Mr. J. H. JONES, Agent of Wells, Fargo & Co., at Denver, and other citizens; and finally, by the observations which my deputy, Mr. EILERS, and myself were enabled to make during a somewhat extended though rapid tour in the Territory, I am enabled to present a very interesting and full account of the condition and progress of mining in Colorado.

The following comparative statement for the years 1870, 1871 and 1872, is compiled from the careful estimates made for me each year by Messrs. SCHIRMER and JONES, whose opportunities and qualifications for obtaining accurate results are unsurpassed. I give the items in detail, instead of comparing the totals only, that it may be clearly seen how the different elements of the total have varied.

GOLD AND SILVER, COIN VALUE.	1870.	1871.	1872.
Express shipments	$2,160,000	$2,820,000	$2,295,411
In private hands from Denver, (est.)	120,000	140,000	50,000
Matte	884,000	923,000	1,019,498
Ore shipped	286,000	500,000	981,556
Southern mines, (est.)	100,000	130,000	140,000
Northern mines, (est.)	50,000	50,000	50,000
Used by mannfacturers, (est.)	75,000	100,000	125,000
Total	$3,675,000	$4,663,000	$4,661,465

According to this exhibit, the product of the Territory for 1872 is about the same as for 1871, the great falling off in express shipments, due to the depression of the industry of Gilpin County, being counterbalanced by the increase in production of matte and shipping ores, due to the increased prosperity of Clear Creek County.

The distribution of the product for 1872 among the respective counties and districts, is partially shown by the detailed reports which follow. But the total obtained by adding all the exact sums reported, would fall far short of that above given. It is impracticable to employ exclusively the method of calculating the bullion at the points of production or at the points of shipment. In the above statement, the returns and estimates are based on the movements or destinations of metal and ores. The item of $1,019,498, classed as matte, represents really the reported purchases of the Boston and Colorado Smelting Company at Black Hawk, at the presumed actual value of the ores, not the price paid for them. The several items are:

Gilpin County	$419,850
Clear Creek County	406,648
Park County	118,000
Boulder County	75,000
Total	$1,019,498

The actual shipment of matte from these works during the year was considerably less (probably not in excess of $800,000) and the difference represents the increase in the reserves of ore in their yard and roasting-heaps at the end of the year.

The following summary, classified as to counties, was published in January, in the *Mining Review*, of Georgetown, Col.:

Clear Creek	$1,503,391
Gilpin	1,389.289
Boulder	346,540
Park	238,000
Lake	133,000
Summit	125,000
All other sources	50,000
Total	$3,785,220

That this estimate is too low, can be easily demonstrated, by an analysis of some of its items. The amounts of *ores* shipped or sold to the Black Hawk works are the same as in my statement; but the aggregate of *bullion* estimated is below that of the actual shipments of bullion reported to me on the authority of Mr. JONES, agent of Wells, Fargo & Co., at Denver. Relying upon the accuracy of his report, and also the judiciousness of his estimates (supported by the opinion of Mr. SCHIRMER, Superintendent of the Mint) for gold not turned over to the Express Company, but either consumed in local manufactures or carried in private hands out of the Territory, and shipped, if at all, from points beyond its boundary—I present the following comparisons of the bullion product in gold and silver—ores and furnace-products not reckoned.

THE MINING REVIEW.		MESSRS. JONES AND SCHIRMER.	
Clear Creek	$223,187	Express shipments	$2,295,411
Gilpin	959,439	In private hands:	
Boulder	271,540	From Denver	50,000
Summit	120,000	Southern mines	140,000
Lake	133,000	Northern mines	50,000
Park	30,000	Manufacturers	125,000
Total	$1,737,166		$2,560,411

The difference of these totals, $823,245, is within $53,000 of the whole difference between the total production of the Territory, as given by the *Mining Review*, and the production as given by Messrs. JONES and SCHIRMER.

Mr. VALENTINE, of San Francisco, general superintendent of Wells, Fargo & Co., published in January a statement of the precious metals produced in 1872 west of the Missouri river, in which the following figures are given for Colorado:

Gold by Express	$1,657,952
Silver by Express	279,799
Ores and base bullion	1,064,000
Carried by private hands	none.
Total	$3,001,751

The too early preparation of this statement perhaps explains the fact that no single item of it can be made to agree with later and more exact information. It is nearly three-quarters of a million below the estimate which I have just shown to be, by at least an equal amount, too small. Entertaining as I do a high respect for Mr. VALENTINE'S great executive ability and general intelligence, I am compelled, nevertheless, to dissent widely from his conclusions regarding the bullion product in almost every instance except those of California and Nevada, where I substantially agree with him.

Returning, after these explanations, to the comparative statement first presented, it will be observed that, for the first time in the history of the Territory, Clear Creek County has surpassed in the production of the precious metals, its earlier-settled and exploited neighbor, Gilpin. The prospects for the future industry of both are set forth in the detailed reports which follow. I find in the exhibit for the year no cause to retract the favorable opinions heretofore expressed concerning the mineral resources and the facilities for mining possessed by Colorado. Of the criticisms contained in former reports, particularly with reference to the excessive and unjustifiable projection of exploring tunnels, it is sufficient to remark, that they have been fully justified by events, as is now generally admitted by all parties. The "tunnel clause" of the present United States

mining law, framed in the interest of such enterprises, has produced much dissatisfaction among prospectors, and will doubtless become practically a dead letter, or be amended or repealed.

American Society of Civil Engineers.

PNEUMATIC FOUNDATIONS.—CONTINUED FROM PAGE 227.

After the completion of this work, Gen. SMITH, in 1869, proceeded to put down at Omaha, for a bridge across the Missouri river, the first pneumatic piles sunk west of the Alleghany mountains, and to a depth greater than ever before reached—82 feet below the water surface. The material was very difficult to penetrate; it consisted of a fine silt, stratified with layers of coarse sand, and tough blue clay—the latter not more than two feet deep, and with a stratum of pebbles or gravel one and a half to two feet deep next to the bed rock. The first pile went down vertically. The second, after sinking twenty-seven feet, took an inclination which could not be corrected in the next twenty feet by the various means applied, which, although they failed here, in many other cases have succeeded at a depth of from forty to fifty feet. Generally the most effective method is, to excavate the material under the pile, and, with heavy wooden wedges, firmly wedge up the lowermost edge: then, by letting the air escape suddenly, bring the atmospheric pressure and the weight of the pile to bear like a blow. In this case, the silt came in so rapidly as to carry the wedges before it. Another cylindrical section was put in place, thus adding ten feet to the length of the pile, making it sixteen feet, and with the air-lock, twenty-two feet above the earth surface. A strong frame of twelve by twelve inch timbers was laid down for a fulcrum; blocks and falls were attached to the air-lock, and a severe strain was put upon the pile. The material was again excavated, and instead of the wedges, a strong beam, cut to the segment of a circle, put down. The pressure was let off and the pile descended, but without any correction of the inclination, although the timbers of the fulcrum were broken.

A pine strut 8×8 inches, 11 feet long, was set at a slight angle; its top against the leaning pile, and its foot against the pile already in place—without avail—and at last the cylinder broke off 27 feet below the surface where there was a "cold shut" in the metal.

With fifteen feet of sand in the cylinder, forty-five pounds air pressure to the square inch did not lift the piece broken off; but twenty-seven pounds were sufficient after the sand was removed. This is the only opportunity he has had to measure approximately the friction on a cast-iron pile. The friction per square inch of surface in contact, before the sand was removed, was greater than 1.77 lb.; and after, it was less than 1.39 lb. This friction must vary with the depth of material, and is diminished when the earth is loosened by the passage of air currents through it. The case instanced differs from that of a pile in place, under a load. An important subject of enquiry is, what should be taken as the safe resistance of such a pile, in sand, to sinking alone, where no bed rock can be reached, as along the lower Mississippi and on the gulf coast it may be desirable to sustain structures upon piles or caissons, resting wholly in and on sand. The next two piles were put down without great difficulty; one at the rate of ten feet per day. To cause the piles to sink, they were loaded by filling the cylinders with stones, except a central passage or well-hole. Frames built within the cylinders kept the stones in place. After reaching a certain depth it was necessary to increase the downward pressure on the pile by allowing a portion of the compressed air to escape; the pile would then sink from two to four feet at a time. The top of the bottom cylinder was covered with a cast-iron diaphragm, through which there was a man-hole, closed by a valve opening inward, which, when shut, prevented more sand from entering the pile while sinking, than would fill the lower cylinder; thereby the tendency to "lurch," and the disturbance of outside material was lessened.

At this stage of the work, Gen. SMITH was succeeded by Mr. THEO. E. SICKLES, who successfully employed levers in forcing the piles down, and corrected the inclination by drilling holes through the higher sides, at different heights, through which the compressed air escaped, loosened the outside material and thus lessened the friction against the pile.

Gen. SMITH then sank the piers for the railroad bridge across the Missouri river, at Leavenworth, Kansas; three in number, (two in the river, and one on the east bank,) upon which, and a stone abutment, three spans, each 340 feet long, were erected. This was finished in two years after its commencement. The difficulties encountered were similar to those at Omaha.

The following conclusions are deduced from an experience of fourteen years in sinking pile foundations.

1. The greatest difficulties to be overcome are: 1st., in keeping the pile vertical; for this it should be made to follow the excavation without a reduction of air pressure; and 2d, in righting the pile when inclined; for this, wedging under the bottom or propping the top on the lowermost side and drilling through the uppermost side, are the best means yet tried.

2. The "air lift" as described is the cheapest and most efficient method of removing sand or mud from within a pneumatic pile or caisson.

3. A strong and reliable pier can be always built of pneumatic piles; their number, diameter, and the thickness of metal being determined by the conditions of the case.

4. In cold climates, these piles may be fractured by frost; to prevent which, a filling below the frost line from two to five feet deep of asphaltic concrete is recommended.

5. Where suitable timber and stone are to be obtained at reasonable prices, a single pneumatic caisson can be sunk with greater certainty and at less cost, than a pair of three or more pneumatic piles, where it has to be sunk for a considerable depth through a soft material to a hard one. A pier of masonry on such a wooden caisson, cellular, with its walls well drift bolted and its interior carefully filled with concrete or rubble, is the cheapest and best bridge foundation yet devised.

6. Concrete does not "set" well under air-pressure; the water was let in through a pipe inserted therefor in the cement to cover the successive layers as put down; usually, cement five feet in depth would seal the pile, the remainder was added in the open air.

DISCUSSION.

Mr. MARTIN.—The first work he had to do in sinking the pneumatic pile piers for a bridge across the Savannah river, on the Charleston and Savannah railroad, in 1861, was to straighten up a cylinder which was about thirty feet in the sand and considerably inclined.

The method described by Gen SMITH of excavating underneath the lowermost edge of the pile, wedging it up firmly, and then, when severely strained in the right direction by strong tackle, causing the pile to go down by suddenly letting the pressure off, did not succeed, although the pile descended two feet or more. He then excavated under the upper edge as much as possible, so that the escaping air passed through and loosened up the material on that side—wedged up and strained the pile as before—and with a battering-ram made of a twelve inch square oak timber, twelve feet long, and in the middle suspended from shear-poles, struck successive blows against the top of the pile; while it was descending, it was thus quickly brought into position.

A pneumatic pile is easier kept vertical than straightened afterward; in most cases it may be guided in its descent by a platform attached to wooden piles driven around it.

Gen. SMITH presented a plan for sinking to any depth pneumatic piles and caissons through sand, whereby the excavation is made without exposing workmen generally to the injurious effects of compressed air, which increases with the depth, and below sixty feet is dangerous.

For a pneumatic pile there should be a short section at the bottom, covered with a plate, through which there are a man-hole and valve, a supply and one or more discharge pipes, the latter made telescopic and with joints, so that a workman standing on the plate may cause the mouth of the pipe to traverse the surface to be excavated beneath the pile.

Thus air, forced into the closed section through the supply pipe, would escape through the discharge pipe and carry with it the material to be removed.

In a caisson, the same principle may be carried out. Men need enter the compressed air chamber only to remove an unusual obstruction.

Such a method is required in sinking foundations to very great depths; the greater the depth, the more efficient is the air lift described.

Of course this plan cannot be adopted where the material to be removed will not yield and flow with an air-current.

A paper by ROBERT CARTWRIGHT, C. E., of Cleveland, Ohio, on "The Manufacture of Pneumatic Piles" was read.

The bridging of the Missouri river was a necessity to the railroads connecting the east and west of this country. The river is a rapid-running, turbid stream, with a bed of treacherous, shifting material, and a channel which changes at every flood.

The bridge at Omaha has eleven spans, 250 feet long, and at Leavenworth, three spans, 340 feet long—both POST'S truss upon pneumatic pile piers. The manufacture of cylinders for these is here described.

First there was built a brick pit, forty-seven feet internal diameter, and fourteen feet deep, water tight, with a foundation in the center for a twenty-five ton crane and four buttresses therefrom, dividing the pit into quarters; each to take two moulds.

For access to the moulds, and to supply air during casting and subsequent cooling, there was a tunnel from each quarter to a shaft sunk outside of the pit. Each mould was built of fire-brick laid in loam upon a level cast-iron bed plate and covered with another similar plate—the two being firmly bolted together. Outside the mould was a casing of sheet iron; a space of a foot between the two being filled with spalls, cinder, and moulding-sand, which allowed the passage of escaping gases—the remaining spaces in the pit were also filled with sand. From the centers of each bed plate up to the top of the mould was a vertical wrought iron shaft upon which the core barrel centered. The inside of the mould was coated about five-eighths of an inch thick with loam, brought to a true surface with a "strike" board revolving about the shaft. That the castings might be of uniform section under the difference of ferro-static head, the diameter of the mould at the bottom was made three-sixteenths of an inch less than at the top. The core barrel consisted of six or more staves, or circular segments, strengthened by ribs cast on them and bolted to two circular spiders, which were attached to a central hollow shaft bored to receive the shaft fixed in the bed plate of the mould; the whole being so arranged that the hollow shaft and spiders could be withdrawn together and the staves left in position, to be afterwards removed singly. The barrel was coated with loam to which a small quantity of chopped hay had been added—no rope being used.

When the mould was coated and dried and the core in place, it was covered with a plate or trough, coated with loam, and well fastened down; through this were twelve holes, one and a half inch in diameter for pouring "sprues," and six

elliptical holes about 3½×1½ inches for "risers;" the last were about twelve inches high and six inches diameter at the top, and were an effectual substitute for a "sinking head." A casing was then placed about the covering plate, forming a "runner" around the whole top of the mould, connected with a pouring basin which had two outlets, each stopped by a "straining" gate to retain the slag.

The mould was filled to the top of the risers, the iron entering simultaneously at twelve equidistant points; and, as shrinkage took place, fresh metal was supplied and "churned" with coated rods. When the iron was "set," the runner casing was taken away, the "sprues" and "risers" broken off with a sledge, and in rapid succession, the covering plate and the several parts of the core barrel removed, leaving the red hot section just cast, in the mould, and free to shrink uniformly as it rapidly cooled, without danger to its shape or soundness. In about fourteen hours after pouring, the section (weighing nine tons) was taken from the mould which was then freshly coated with loam; the bricks were usually hot enough to nearly dry it. As its parts were withdrawn, the core barrel was put together and then coated with loam, which was almost dried by the heat retained. The barrel was then placed vertically on a car and run into the core oven which was large enough to receive four.

The loam was prepared in a loam mill, consisting of a revolving pan and two heavy cast-iron chasers; it was, with the addition of a little fresh material, repeatedly used.

With eight moulds and six core barrels, one, and sometimes two sections were made daily for months. Two hundred and eighty-one sections were cast, eight and a half feet in diameter, ten feet long—some one and three quarter inch and the others one and a half inch thick—each with a four and a half inch inside flange, two and a half inches thick, at each end. Of these only one was lost, and this by the breaking of a brace after the mould was nearly full. The two flanges were faced in a lathe at the same time, and then each drilled with sixty-one holes for one and one-eighth inch bolts.

A paper by C. D. WARD, C. E., of Jersey City, N. J., giving "Description of Screw Piles for Supporting a twenty-four inch Water Main across the Providence River, Providence, Rhode Island," was read.

The piles were placed in a single row, twelve feet apart, with a cap or rest on the top of each, in which the water pipe rests.

They were each twenty-two feet long, ten inches exterior diameter, one inch thick, and weighed about 2,500 lbs. The largest diameter of screw was three feet, and the pitch was ten inches; there were two threads, each making three-fourths of a turn.

The piles descended from six to eight and a half inches per revolution, and were put down by eight to twenty-one men with ropes attached to levers ten and a half feet long. The direction of draft reduced the effective leverage to about seven and a half feet.

Twelve piles were put down from nine to twelve feet each in sand and gravel in five days; when regularly moving, the ordinary rate of sinking was about two feet per minute.

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. All members and Associates who pay their dues ($10,) for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

Those members and associates who have not paid their dues for the current year, are requested to do so at once. Money may be sent in postal orders, checks or bank bills, to the Secretary, THOMAS M. DROWN, 1123 Girard street, Philadelphia, Pa.

II. It is expected that the more important papers, read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

III. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

V. The annual meeting for 1873 will take place in Philadelphia, May 20. Communications in reference to it can be addressed to the secretary.

THOMAS M. DROWN, Secretary.
1123 Girard street, Philadelphia, Pa.

Advertisements.

The special advantages of the ENGINEERING AND MINING JOURNAL, *as a medium for advertisers, are so great and so widely known that it may seem almost needless to call attention to them. It is extensively circulated among the engineers of the country and takes a position in this respect before any other publication of the kind. It has a large and constantly increasing circulation among miners and mine owners, and men connected with mining operations generally. As it is the only paper in the country that makes this subject a specialty it has this field entirely to itself, and is the only direct and reliable means of reaching this class of persons. Being kept on file by almost every subscriber, it is doubly valuable as a permanent means of keeping an advertisement before the public. It is the Organ of the* AMERICAN INSTITUTE OF MINING ENGINEERS, *and is regularly received and read* BY ALL THE MEMBERS AND ASSOCIATES *of that large and powerful society,* THE ONLY ONE OF THE KIND IN THIS COUNTRY. *It is therefore the best medium for advertising all kinds of machinery, tools and materials used by engineers or their employees. It is the recognized organ of the coal trade, and is taken extensively by the trade throughout the country, and presents the very best means of reaching that very important class of men.*

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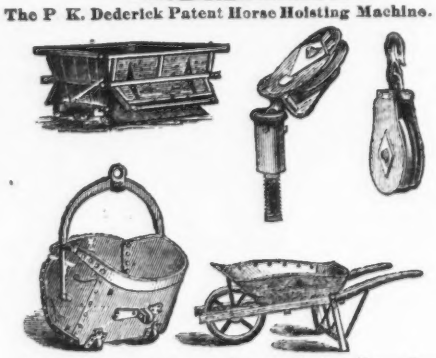

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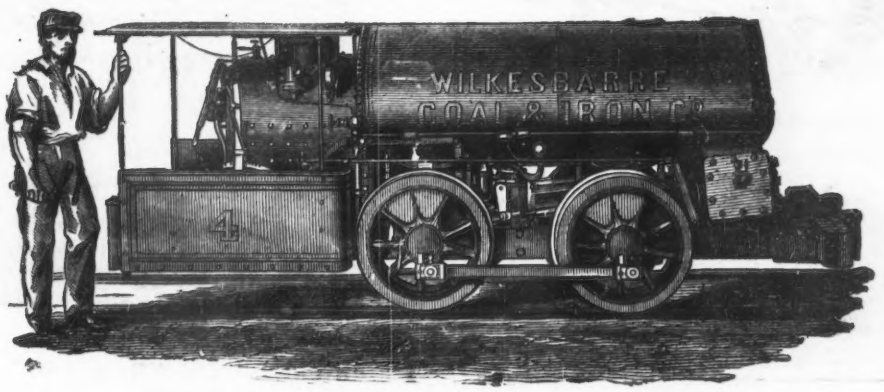

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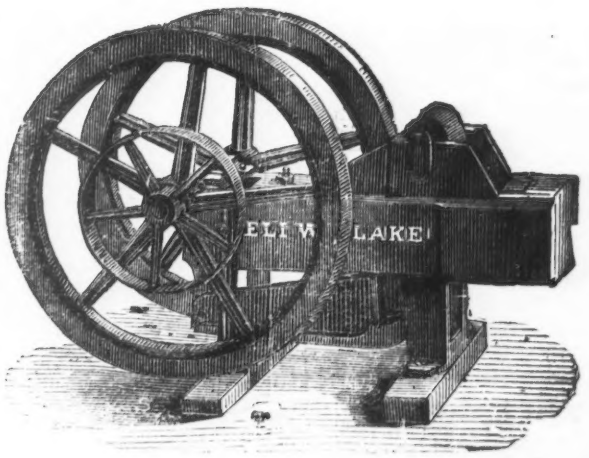

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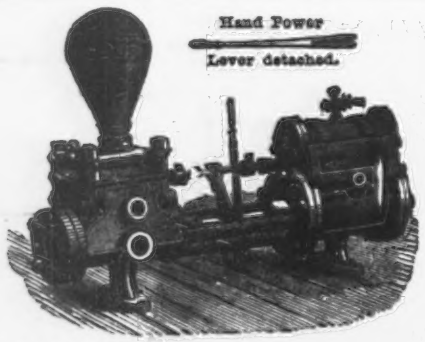

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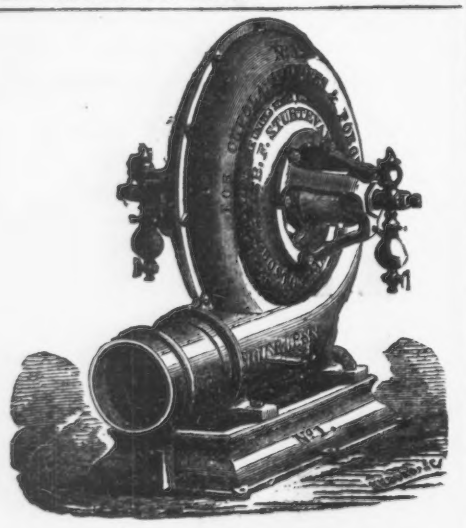

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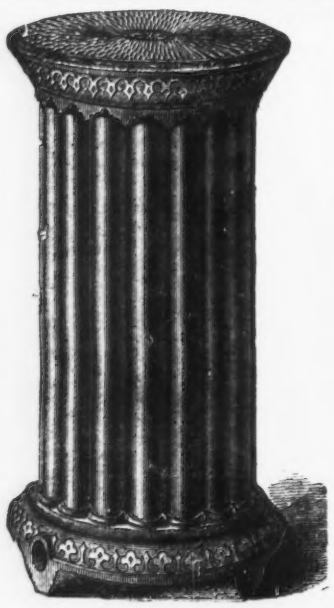

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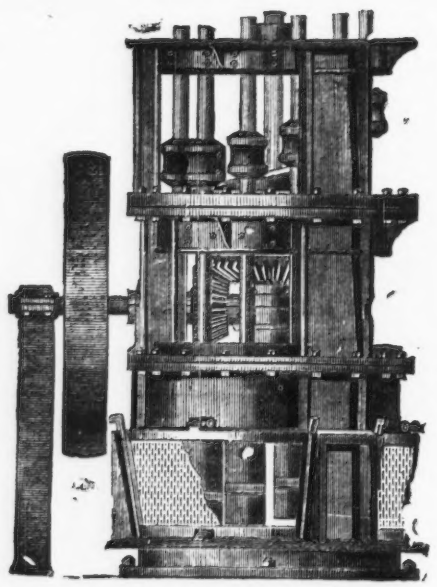

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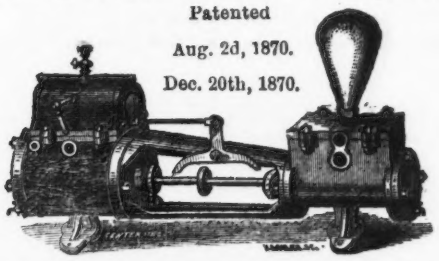
Dec. 20th, 1870.



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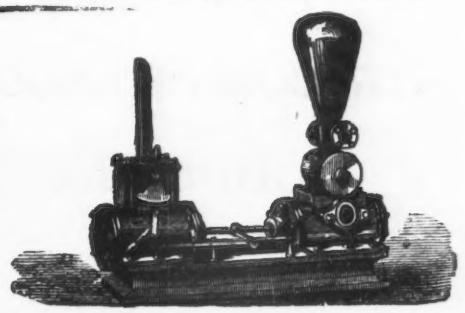

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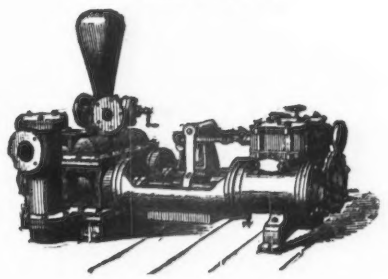

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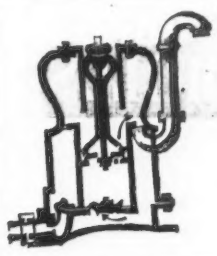

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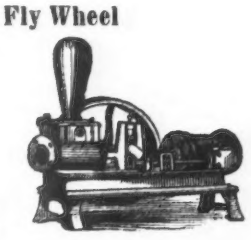

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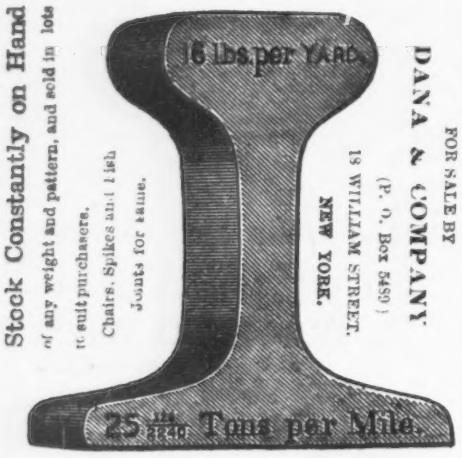

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